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THE

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THE RÔLE OF EXPERIENCE IN DESCARTES' THEORY OF METHOD. II.*

IV. Descartes on Hypotheses.

IN so far as Descartes admits the utility and the necessity of crucial experiments in physical inquiries, it is already evident that he is at least tacitly admitting the existence of an element of hypothesis in the situation. The "many different ways" in which "any particular effect" may be "deduced" from the principles are really so many hypotheses, all in accordance with general mechanical laws, but between which only further experiment can decide which is the one that gives the true cause. But the obvious problem now arises, how under these circumstances can we ever *know* that we have discovered the true cause? For how can we ever be sure that we have excluded all even of the mechanically possible alternatives? If this problem cannot be resolved the "absolute certainty" which Descartes desires for the whole of his physics will after all extend only so far as the general principles themselves, and not to the details of the explanations offered of particular phenomena. That Descartes is aware of the difficulty is already evident from a remark quoted above:—"experiments themselves often give us occasion to deceive ourselves, when we do not sufficiently examine all the causes they may have." And it is noteworthy that he does not here expect, and nowhere else ventures explicitly to claim, that this difficulty can be in any way met by means of *a priori* deduction. Here and elsewhere it is to *experience* once

* Part I of this article appeared in the preceding number of this Review, pp. 125–143.

more, and especially to experiment, that he looks for the solution.

Sometimes, indeed, for certain limited purposes, and on certain occasions, Descartes is content to offer particular mechanical explanations as *mere* hypotheses such as *would* suffice to explain the given phenomena if they were true, but which, for all we know to the contrary, may be pure fictions. On such occasions Descartes claims for the hypotheses he offers not *truth*, but merely *possibility*. In the *Regulæ*, for example, he recommends us to consider all physical realities as though possessing primary qualities only. But he represents this simply as a methodological convenience. We need by no means necessarily deny them actually to possess other qualities also; but it will be an aid to clear and consecutive reasoning about them if we imaginatively represent to ourselves the differences, say, between the various colours of things, as though these were reducible simply to geometrical differences in the things themselves. This hypothetical representation may not answer to the real nature of the physical world; but it will be most convenient to our thinking about it.[70] Here the hypothesis is explicitly put forward as a fiction, an abstract way of viewing things which, taken abstractly, may well be false; but which will enable us to think more clearly, and to deduce results which accord with the phenomena of experience. So too the hypothesis concerning the creation of the world briefly summarised in the *Discourse*[71] is there, in order to avoid theological complications, advanced explicitly as a convenient fiction. In the French version of the *Principia* it is even characterised as "absolutely false";[72] but it is the difficulty of reconciling his view of the matter with the revealed account in *Genesis* that here determines Descartes' attitude.

There are passages, moreover, where Descartes seems to go even further and to contend that we have no right to require or

[70] *Regulæ ad Directionem Ingenii*, Regula XII, Vol. X, pp. 412–413: "mihi sufficiet quam brevissime potero explicare quisnam modus concipiendi illud omne, quod in nobis est ad res cognoscendas, sit maxime utilis ad meum institutum. Neque reditis, nisi lubet, rem ita se habere: sed quid impediet quominus easdem suppositiones sequamini, si appareat nihil illas ex rerum varietate minuere sed tantum reddere omnia longe clariora? etc."

[71] *Discours de la méthode*, V^e^ Partie, Vol. VI, p. 42, *sqq.*

[72] *Les principes de la philosophie*, III^e^ Partie, Ch. 45, Vol. IX, pp. 123–124. So too in *Le monde*, Vol. XI, pp. 31, 36.

to expect that any explanatory hypothesis in physics be shown to be more than a *possible* explanation of the phenomena in question. He appears to hold that such hypotheses should be required to satisfy two conditions only: they must assume as principles nothing that is in manifest contradiction with the facts of experience; and in the deductions which lead from these principles to their consequences there must be no fallacies. "For we are satisfied, in such matters, that authors, having presupposed certain things that are not manifestly contrary to experience, for the rest shall have spoken consistently and without committing any paralogisms, even though their suppositions were not precisely true. For I might demonstrate that even the definition of the centre of gravity given by Archimedes is false, and that there is no such centre; and the other things which he supposed also are not precisely true either. As for Ptolemy and Witelo, they make suppositions much less certain, and nevertheless we should not, for all that, reject the demonstrations which they have deduced therefrom." [73]

From this point of view there are only two legitimate grounds of objection to a hypothesis in physics. For "know," says Descartes, "that there are only two ways of refuting what I have written, of which the one is to prove by some experiments or reasons that the things I have assumed are false; and the other is to prove that what I have thence deduced cannot be thence deduced. . . . But as for those who content themselves with saying that they do not believe what I have written because I deduce it from certain suppositions which I have not proved, they do not know what they are asking, nor what they ought to ask." [74] Again, towards the close of the *Principia* [75] he writes: "But here it may be said that although I have shown how all natural things can be formed we have no right to conclude on this account that they were produced by these causes. For . . . doubtless there is an infinity of ways in which all things that we see could be formed by the great Artificer without it being possible for the mind of man to be aware of which of these

[73] *Letter to Mersenne*, 17 May, 1638, Vol. II, p. 142.

[74] *Ibid.*, pp. 143–144.

[75] *Principiorum Philosophiæ Pars Quarta*, Cap. CCIV, Vol. VIII, pp. 327, *sqq.* H. R. Vol. I, p. 300.

means he has chosen to employ. This I most freely admit; and I believe that I have done all that is required of me if the causes I have assigned are such that they correspond to all the phenomena manifested by nature without inquiring whether it is by this means or by others that they are produced." And he concludes by quoting Aristotle's familiar dictum in the *Meteorology*. Descartes here actually appears to concede that it is not *possible* for the human mind to know that the causes which he has supposed are the true ones. But in view of what he goes on to say in the immediately succeeding chapters he must not here be interpreted too literally. This extreme admission must be taken to be for the purposes of the argument with the supposed objector. Descartes' point really is that even though this were conceded, and the causes which he has assigned to the phenomena were admitted to be mere hypotheses, he has nevertheless done all that is required *for practical purposes*, if he has given a set of workable hypotheses—"it will be sufficient for the usage of life to know such causes." [76] And this seems to be the general explanation of such passages. It is "sufficient" in such matters to have any possible hypothesis in terms of which the actual phenomena can be predicted. More is not required for practical purposes.

At any rate Descartes is not really prepared to rest permanently in any such view of the matter. Whatever his occasional concessions to less realistic views of hypotheses, he never finally acquiesces in such interpretations. He may dally with them for the moment, when it suits his purpose to do so, but his thirst for certitude and his conviction of the possibility of attaining it are too strong to permit him to give them any permanent credence. He is really thoroughly convinced that his hypotheses are far more than mere fictions or abstract possibilities. In his view the real physical world actually contains none but primary qualities; the astronomical and physical hypotheses by which he explains the phenomena are literally and physically true.

In fact he insists that even on an empirical basis his hypotheses can be securely established as constituting the true explanation of the phenomena of nature. Just as we cannot take seriously

[76] *Loc. cit.*

and literally his occasional declarations concerning the complete *a priori* deducibility and absolute certainty of the whole of physics; so we cannot, in view of the *ensemble* of his doctrine, accept these occasional expressions of extreme empiricism, which if taken strictly amount to a denial of any certitude, or even of any grounded probability for any of the explanatory hypotheses of physics.

If the explanatory principles laid down at the beginning of the *Dioptrique* and the *Météores* are described expressly as "suppositions", it is not because Descartes thinks that he has not even in those very treatises sufficiently demonstrated them. He calls them "suppositions" for the moment, but only because he does not desire just then to enter into the proof of them by deduction from the primary principles of physics, and ultimately from metaphysics. "And I have not named them hypotheses with any other object than that it may be known that while I consider myself able to deduce them from the primary truths which I explained above, yet I particularly desired not to do so." [77] But they have none the less received a perfectly adequate demonstration of another sort. The nature of this demonstration Descartes describes as follows: [78] "As to the hypothesis that I made at the beginning of the *Météores*, I could not demonstrate it *a priori* without giving my whole physics; but the experiments that I have deduced from it necessarily, and which cannot be deduced in the same fashion from any other principles, seem to me sufficiently to demonstrate it *a posteriori*. . . . As, in fact, it is not always necessary to have reasons *a priori* in order to persuade one's hearers of a truth; and Thales, or whoever it was, who first said that the moon receives its light from the sun, doubtless gave of this no other proof than that by making this supposition we explain very easily all its different phases: which was sufficient to bring it about that henceforth that opinion was received by the world without contradiction. And the connexion of my thoughts is such that I dare hope that my principles will be found as well proved by the consequences that I derive from them, when they shall have been noticed sufficiently

[77] *Discours de la méthode*, VI[e] Partie, Vol. VI, p. 76. H. R., Vol. I, p. 129.
[78] *Letter to Vatier*, 22 February, 1638, Vol. I, pp. 563–564.

to render them familiar and to cause them to be considered all together, as the fact that the moon borrows its light is proved by its waxing and waning." Or, as he puts it in the *Discourse*, "If some of the matters of which I have spoken in the beginning of the *Dioptric* and *Meteors* should at first sight give offense because I call them hypotheses and do not appear to care about their proof, let them have the patience to read these in entirety, and I hope that they will find themselves satisfied. For it appears to me that the reasonings are so mutually interwoven, that as the later ones are demonstrated by the earlier, which are their causes, the earlier are reciprocally demonstrated by the later which are their effects." [78a]

At first sight this sort of demonstration may seem to involve a vicious circle. But such is not really the case; for "since experience renders the greater part of these effects very certain, the causes from which I deduce them do not so much serve to prove their existence as to explain them; on the other hand, the causes are proved by the effects." [79] Or, as Descartes explains to an objector, there is no circle involved "in explaining effects by a cause and then proving the cause by them; for there is a great difference between *proving* and *explaining*. To which I add that one may use the word *demonstrate* to signify both the one and the other, at least if one takes it according to common usage, and not in the special signification which Philosophers give it." [80]

But how, after all, is this "proof" of the "cause" to be accomplished? The truth of an hypothesis cannot be established merely by shewing that the consequences legitimately deduced therefrom are actually verified in the facts of experience. The nerve of the proof must lie elsewhere. It is indicated in a passage [81] where Descartes says "the experiments that I have deduced from it necessarily, and which cannot be deduced in the same fashion from any other principles, seem to me sufficiently to demonstrate it *a posteriori*." He puts the same points elsewhere as follows: "I examined all the principal differences which

[78a] *Discours de la méthode*, VI[e] Partie, Vol. VI, p. 76. H. R., Vol. I, pp. 128–9.
[79] *Loc. cit.*
[80] *Letter to Morin*, 13 July, 1638. Vol. II, p. 198.
[81] Cited above in *Letter to Vatier*.

may be found between the figures, sizes and motions of various bodies which only their smallness renders insensible, and what sensible effects may be produced by the diverse ways in which they are combined. Afterwards when I met with like effects in the bodies which our senses perceive, I thought they might have been so produced. And then, when it seemed to me impossible to find in the whole extent of nature any other cause capable of producing them, I believed that they had infallibly been so produced." [82]

There is obvious exaggeration here. How could Descartes really so assure himself that "in the whole extent of nature" there is "no other cause capable of producing" the effects in question, as to warrant him in concluding "that they had infallibly been so produced?" Nevertheless he has a real point to make in this connexion. It is not merely that from the given hypotheses can be deduced just the particular effects under investigation. The essential fact is that one and the same set of hypotheses serves to explain a wide range of diverse phenomena, extending beyond the particular effects in question. When this is found to be the case, we can scarcely doubt that we have reached the true cause. "Although it is true that there are many effects to which it is easy to fit different causes, one for each, it is not always so easy to fit one and the same cause to many different effects, unless it is the true cause from which they proceed; there are even effects which are so many and diverse that it is sufficient proof of their true cause to give even one from which they can be clearly deduced; and I claim that all those of which I have spoken are of this number." [83]

Moreover, once the initial hypotheses have been validated by the conformity of some of their consequences with a sufficiently wide variety of experimental data, they may be used in turn to prove the reality of any of their consequences which may be called into question. For "know that each of these effects may also be proved by this cause, in case it be brought into doubt,

[82] *Les Principes de la Philosophie*, IV^e^ Partie, Ch. 203, Vol. IX, p. 321.

[83] *Letter to Morin*, 13 July, 1638, Vol. II, p. 199. *Cf.* also *Letter to Plempius*, 3 October, 1637, Vol. I, pp. 423–424, especially, "Quae quamvis singula sejunctim considerata non nisi *probabiliter* persuadeant, omnia tamen simul spectata *demonstrant*."

and the cause have been proved, by other effects." [84] Nor is any circle involved "in proving a cause by several effects which are known otherwise, and the reciprocally proving certain other effects by this cause." [85]

In fact this *a posteriori* demonstration of true causes is applicable to, and sufficient of itself to put beyond all reasonable doubt, the truth of the primary and most fundamental principles of physics themselves. If all the phenomena of nature can be explained in terms of one and the same single set of principles, this fact tends of itself to establish the truth of those principles. For "it can hardly be that causes from which all phenomena are clearly deduced are not true." [86] "They who observe how many things regarding the magnet, fire, and the fabric of the whole world, are here deduced from a very small number of principles, although they considered that I had taken up these principles at random and without good grounds, they will yet acknowledge that it could hardly happen that so much should be coherent if they were false." [87]

Hence the great superiority, in Descartes' view, of his own over the Scholastic physics. The Scholastics are accustomed to imagine a different cause to explain each different sort of effect. Descartes makes use of a single supposition only—that bodies are composed of minute particles too small to be perceived. Now then, "If the suppositions of others be compared with mine, that is to say all their *real qualities*, their *substantial forms*, their *elements* and like things, of which the number is almost infinite, with that single one, that all bodies are composed of certain parts . . . and finally if what I have deduced from my suppositions, concerning vision, salt, winds, clouds, snow, thunder, the rainbow, and like things, be compared with what the others have deduced from theirs concerning the same matters I hope that will suffice to persuade those who are not too much preoccupied that the effects which I explain have no other causes than those whence I have deduced them. . . ." [88]

[84] *Letter to Morin*, 13 July, 1638, Vol. II, p. 199.
[85] *Loc. cit.*
[86] *Principiorum Philosophiæ*, Pars Quarta, Cap. XLVIII, Vol. VIII, p. 99.
[87] *Ibid.*, Cap. CCV, Vol. VIII, p. 328. H. R., Vol. I, p. 301.
[88] *Letter to Morin*, 13 July, 1638, Vol. II, p. 200.

Moreover, the truth of these first principles, since it rests upon a wider empirical basis, is thus established with a greater certainty than the particular cause of any particular effect can ever be. "I think the same particular effect can be explained in several different ways; but I think the possibility of things in general can be explained in one way only, which is the true way." [89] That is to say, given a single system of principles which profess to limit and circumscribe the possibilities of nature (as do the principles of the Cartesian physics) the fact that no natural phenomenon is anywhere empirically discoverable which is not fully explicable in accordance with these principles demonstrates their truth in a particularly cogent fashion.[90] It is on this point that Descartes' criticism of the procedure of Galileo turns. He praises him for applying mathematical methods to the examination of physical problems, but nevertheless remains dissatisfied with his results because he failed to shew systematically how all natural phenomena can be explained in terms of a single set of first principles. "Without having considered the first causes of nature he has merely sought for the causes of certain effects and has thus built without foundation." [91]

Although these are the most fundamental, they are not, however, the *only* empirical considerations that enable us to distinguish true causes. In so far as our explanatory hypotheses involve the supposition of entities not immediately accessible to sense perception, they will scarcely be true, or even intelligible at all, if they are not conceived on the analogy of what we *do* perceive. To proceed otherwise is in fact to commit the fallacy of explaining *ignotum per ignotius*. "Nor do I think that anyone who uses his reason will deny that we do much better

[89] *Letter to Mersenne*, 28 October, 1640, Vol. III, p. 212.

[90] Gilson (*Comment.*, p. 454) sums up Descartes' doctrine concerning the *a posteriori* proof of true causes, as follows: "Le caractère auquel on reconnaît la vérité d'un principe scientifique est, en effet, son aptitude à expliquer un grand nombre de phénomènes sans recourir à des hypothèses supplémentaires inventées pour la circonstance. Les principes de l'École sont sans valeur parce que, les formes substantielles une fois admises, il faut admetter une forme spéciale pour expliquer les propriétés de chaque espèce de corps; les principes cartésiens sont vraies parce que, une fois admis, ils expliquent à eux seuls les phénomènes les plus évidents de la nature, sans que jamais aucune hypothèse supplémentaire ne doive être invoquée." *Cf.* Newton's conception of "true causes."

[91] *Letter to Mersenne*, 11 October, 1638, Vol. II, p. 380.

to judge of what takes place in small bodies which their minuteness alone prevents us from perceiving, by what we see occurring in those that we do perceive [and thus explain all that is in nature, as I have tried to do in this treatise], than, in order to explain certain given things, to invent all sorts of novelties, that have no relation to those that we perceive [such as are first matter, substantial forms, and all the great array of qualities which many are in the habit of assuming, any of which it is more difficult to understand than all the things which we profess to explain by their means]." [92] And Descartes further makes the claim that his "new" system of physics is, precisely on the ground of its preservation of this analogy, preëminently that of common sense. In fact he lays it down "that there are no principles in this treatise which are not accepted by all men; and that this philosophy is not new, but is the most ancient and most common of all." [93] "They will be found to be so simple and so conformable to common sense, as to appear less extraordinary and less paradoxical than any others which may be held on similar subjects." [94] For "no one ever doubted that bodies were moved and have diverse magnitudes and figures, according to the diversity of which their motions also vary, and that from mutual collision those that are larger are divided into many smaller, and thus change their figure. We have experience of this. . . ." [95] Consequently, "I hope that those who avail themselves only of their natural reason in its purity may be better judges of my opinions than those who believe only in the writings of the ancients." [96]

[92] *Principiorum Philosophiæ*, Pars Quarta, Cap. CCI, Vol. VIII, pp. 324–325; *Les Principes de la Philosophie*, IV[e] Partie, Ch. 201, Vol. IX, pp. 319–320. H. R., Vol. I, pp. 297–298. *Cf. Cogitationes privatæ*, Vol. X, pp. 218–219: "Cognitio hominis de rebus naturalibus, tantum per similitudinem eorum quae sub sensum cadunt: et quidem eum verius philosophatum arbitramur, qui res quæsitas felicius assimilare poterit sensu cognitis."

[93] *Principiorum Philosophiæ*, Pars Quarta, Cap. CC, Vol. VIII, p. 323. H. R., Vol. I, p. 296.

[94] *Discours de la méthode*, VI[e] Partie, Vol. VI, p. 77. H. R., Vol. I, p. 129.

[95] *Principiorum Philosophiæ*, Pars Quarta, Cap. CC, Vol. VIII, pp. 323–324. H. R., Vol. I, pp. 296–297.

[96] *Discours de la méthode*, VI[e] Partie, Vol. VI, p. 77. H. R., Vol. I, p. 130. *Cf. Regula* IV, Vol. X, p. 371: "quod etiam experientia comprobatur, cum sæpissime videamus illos, qui litteris operam nunquam navarunt, longe solius et clarius

V. Moral *vs.* Absolute Certainty.

But when all is said and done, Descartes recognizes that *a posteriori* proofs, however high a probability they may establish that our hypotheses embody "true causes"—and they may go so far as to make it so improbable that any other causes are the true ones as to make this "seem incredible"—give us, after all, only a "moral certainty that all the things of this world are such as has here been shown they may be."[97] Can he rest satisfied with this result? We know how he longs for an absolute certitude in physics comparable to that of the purely mathematical disciplines. We know how desperately he desires to conclude that the hypotheses which he has been led to assume as to the causes of natural phenomena, whether in astronomy or in physics, represent not only *de facto* physical actuality, but also metaphysical and mathematical necessity; not merely probable truth or "moral certainty," but absolute certainty, conferred upon them by rigorous demonstration from self-evident first principles of reason.

Can he really claim so much? We know already that he believes he can, so far at least as concerns the primary principles of physics—the most general laws of nature. *A posteriori* proof is in itself capable of establishing these with "moral certainty," but Descartes believes that these at least can also be demonstrated *a priori* with absolute certainty. But what of the *particular* mechanical hypotheses that he has elaborated as explanations of particular natural phenomena? Are these also capable of being raised to this height of infallible truth? In the concluding chapter of the *Principia* we find him wrestling with this problem. And here it is highly instructive to compare the varying expressions of the Latin and the French versions.[98]

The title of the chapter begins boldly (Fr.), "we possess even

de obviis rebus judicare, quam qui perpetuo in scholis sunt versati." *Cf. Les Principes de la Philosophie*, Preface, Vol. VIII, pp. 8–9: "From this we must conclude that those who have learnt least about all that which has hitherto been named philosophy, are the most capable of understanding the truth." H. R., Vol. I, p. 208.

[97] *Les Principes de la Philosophie*, IV^e^ Partie, Ch. 205, Vol. IX, p. 323.

[98] *Principiorum Philosophiæ*, Pars Quarta, Cap. CCVI, Vol. VIII, pp. 328–329; *Les Principes de la Philosophie*, Ch. 206, Vol. IX, pp. 324–325.

more than a moral certainty of it" (*sc.* that "all the things of this world are such as has been here shown they may be"). But Descartes is conscious of the difficulty concerning particular mechanical hypotheses, and is obliged immediately to qualify his original statement (L. only)—"there are some [*i.e.*, I take it, the fundamental principles] even among natural things which we judge to be absolutely and more than morally certain." To this class belong such truths as are attested by clear and distinct perception, and thus ultimately guaranteed by the metaphysical fact of God's existence and veracity. "Of this character are the demonstrations of mathematics, the knowledge that material things exist, and all evident reasonings concerning them (L.)." More particularly, "it [*sc.* this more than moral certitude] extends to all the things that can be demonstrated concerning these bodies, by the principles of mathematics or by others as evident and certain (L.)." "To which class it seems to me that the things I have written in this treatise should be admitted (Fr.)." But too much is here implied, and a qualification is immediately introduced—"*at least the principal and more general* (Fr.)." "And I hope they will be (Fr.)", or "perhaps they will be (L.)", "by those who consider that they are deduced in a continuous series from the primary and most simple principles of human knowledge (L.)." But Descartes knows quite well that particular mechanical hypotheses cannot be deduced wholly *a priori* from metaphysical principles, for (1) they follow from *a priori* principles only when these are taken together with a knowledge of certain data that can be given only empirically, and (2) it is always impossible *absolutely* to exclude the possibility of other mechanical hypotheses equally "deducible" from the *a priori* principles. And thus he is obliged to qualify once more, and to conclude as follows: "especially if it be sufficiently understood (L.)" "that the heavens are fluid (Fr.)" [note the intrusion of empirical data], "for these points (*sc.* concerning the fluidity of the heavens) being admitted, all the rest, at least the more general that I have set down concerning the world and the earth, will appear to be scarcely capable of being understood otherwise than in the way I have explained them (L.)" The French here contains even more reserves and qualifications—

"this single point (*sc.* the fluidity of the heavens) being admitted as sufficiently demonstrated by all the effects of light [note the empirical basis of this "demonstration"], and as a consequence of all the other things that I have explained, I think that it ought also to be recognized that I have proved by mathematical demonstration [but note that Descartes has already admitted that the premisses of this "mathematical demonstration" are in part of empirical origin] everything that I have written." But once more this is going too far. Descartes has not always in every particular case been able to exclude the possibility of mechanical hypotheses alternative to his own. Hence a further restriction—"at least the more general points concerning the fabric of the heaven and the earth and in the way in which I have stated them: for I have been careful to propose as doubtful all those that I thought were so."

This is the final word in the matter. Descartes' purely *a priori* physics fails, even on his own showing, quite to come off.

VI. The Place of "Induction" in Descartes' Theory of Method.

It remains for us briefly to consider one further function assigned to experience in the Cartesian theory of method. For Descartes, like Aristotle, maintains that the ultimate principles of physics themselves, and indeed of all knowledge whatsoever, have, in one sense at least, their origin in experience of particulars. However much he may speak in this connexion of "innate ideas", and however much the guarantee of the truth of the primary principles is to be found in the self-evidence of a rational intuition, rather than in any multiplication of empirical instances, the fact nevertheless remains, that for Descartes, as for Aristotle, the process by which these "innate ideas" are actually brought into explicit consciousness is one which as a matter of fact begins with experience of particulars. Thus Descartes characterizes it as an "error" to suppose that "the knowledge of particular propositions must always be deduced from universals": one who really understands how we ought to seek truth will see that "in order to find it we must always begin with particular ideas in order to arrive at those that are general, although one

can also reciprocally, once having found those that are general deduce from them others that are particular." [99] For example, the truth "that everything that thinks is, or exists" has been "learned from the experience of the individual—that unless he thinks he cannot exist." Of any details of the process by which we thus pass from an individual experience to the general truth there exemplified Descartes has practically nothing to say. He recognizes, indeed, the precariousness of the inductive "leap". We run a risk of error "as often as we judge that we can deduce anything universal and necessary from a particular or contingent fact." [100] As for the rest, he can only say that "our mind is so constituted by nature that general propositions are formed out of knowledge of particulars." [101] And this simple proposition may thus be said to contain practically his whole theory of inductive generalisation.

Descartes in fact believed, like Aristotle, that the human mind possesses a further inexplicable power, through the exercise of a rational intuition, of distinguishing, within the contingent complications of particular phenomena as revealed to us in experience, those relations which are truly universal and necessary precisely because they hold between the ultimate and simple universal natures into which the complicated particulars can be analytically resolved. "This mental vision extends both to all those simple natures, and to the knowledge of the necessary connexions between them." [102] The mind, according to Des-

[99] *Sur les V^es Objections*, Vol. IX, pp. 205–206.

[100] *Regula XII*, Vol. X, p. 424: "quoties ex re particulari vel contingenti aliquid generale et necessarium deduci posse judicamus." Tr. H. R., Vol. I, p. 45.

[101] *Responsio ad Secundas Objectiones*, Vol. VII, pp. 140–141.

[102] *Regula XII*, Vol. X, p. 425. H. R., Vol. I, p. 45. *Cf. Regula VI*, Vol. X, p. 383: "paucas esse dumtaxat naturas puras et simplices, quas primo et per se, non dependenter ab aliis ullis, sed vel in ipsis experimentis, vel lumine quodam in nobis insito, licet intueri"; also *Regula VIII*, Vol. X, p. 394: "de rebus tantum pure simplicibus et absolutise xperientiam certam haberi posse." *Cf.* Heimsoeth, Heinz—*Die Methode des Erkenntnis bei Descartes und Leibniz*, Giessen, 1912–1914, p. 71; also J. Berthet, "La méthode de Descartes avant le Discours," *Revue de Métaphysique et de Morale*, 1896, pp. 399–415; J. L. Mursell, "The Function of Intuition in Descartes' Philosophy of Science", THE PHILOSOPHICAL REVIEW, 1919, pp. 391–409, "when Descartes speaks of intuition, he is dealing with the actual practice and procedure of the expert investigator. The expert will develope and possess a power of immediately perceiving the essential factors of a complex situation."

cartes, is able to do this sometimes directly, and sometimes only by the aid of certain processes preparatory to and subordinate to intuition proper. One of these processes is that to which he gives the name of analogy or "imitation." It enables us to reach a conclusion regarding the necessary relations embodied in a particular concrete experience, the complication of which is such that the "natural light" is unable immediately to unravel it, from a consideration of some simpler and more familiar experience, real or depicted in the imagination, where the same relations appear in a form more easily grasped by the mind. "Note that the only reason why preparation is required for comparison . . . is the fact that the common nature we spoke of does not exist equally in both, but is complicated with certain other relations or ratios. The chief part of human industry consists merely in so transmuting these ratios as to show clearly a uniformity between the matter sought for and something else already known." [103] Berthet [104] cites from Poisson a passage which seems to throw some light upon the procedure that Descartes here has in mind. It is a question of the colours observed in the rain. For such relatively complicated objects as drops of rain we first substitute analogous but geometrically simpler objects, namely, balls of glass. We then distinguish between the shape the movement etc., of the balls of glass, attributing to the shape the effects of the shape, to the movements the effects of the movements, to rest and various dispositions of the balls the effects which depend upon these. In each case these relations of cause and effect are necessary and universal relations between simple natures, and are such that reason discerns them, abstracting from the complication that comes from their mutual interference in the concrete phenomena. Having discovered these relations in the simpler case of the glass balls the reason is then able to trace them also in the more complicated case of the raindrops.[105] Another auxiliary process

[103] *Regula XIV*, Vol. X, p. 441. H. R., Vol. I, pp. 55–56.

[104] *Op. cit. Cf.* Descartes, *Météores*, Discours VIII, Vol. VI, p. 325, sqq.; Poisson, *Commentaires et remarques sur la méthode de René Descartes*, 2e Partie. 7e Observation; Liard, *Descartes*, p. 30 and note.

[105] *Cf. Regula VIII*, Vol. X, p. 395: "atque si statim in secundo gradu illuminationis naturam non possit agnoscere, enumerabit . . . alias omnes potentias naturales, ut ex alicujus alterius cognitione saltem per imitationem . . . hanc etiam intelligat."

is that which Descartes knows by the name of "enumeration". At first sight this process suggests to a modern reader the idea of induction by complete or incomplete enumeration. In fact Descartes himself distinguishes between a complete and an incomplete enumeration, and gives examples which seem to be of an inductive process. Moreover, he calls it "enumeration or induction".[106] A further examination of his treatment of the matter shows, however, that such an interpretation of Descartes' meaning would scarcely be warranted, and that as a matter of fact "enumeration" is for him hardly an inductive process at all, but rather, like his "analogy", a process merely auxiliary to intuition or deduction. It consists essentially in a rapid running over in thought of the steps of a long or complicated deduction, which serves to reassure us of its validity by a sort of comprehensive glance at the course of the demonstration as a whole. "It is therefore necessary that my thought run over them repeatedly, until I pass so quickly from the first to the last as to seem, almost without the aid of memory, to embrace the whole in a single intuition".[107] The deduction "is perceived by intuition when it is simple and clear, but not when it is complex and involved. Then we give it the name of enumeration and induction, because it cannot be comprehended in one whole at a glance of the mind, but its certainty depends in some measure on the memory."[108] "For in all cases where we have deduced propositions immediately from one another, if the inference has been evident, they have already been reduced to a true intuition. But if we infer a proposition from various and disconnected premisses, it frequently happens that our intellectual capacity is not such that it can embrace them all in a single intuition; in this case we must be satisfied with the certainty of this operation (*sc.* of "enumeration" or "induction")."[109]

Such an enumeration must in all cases be "sufficient";[110] but it need not necessarily be in all cases "complete" or "distinct". Sometimes completeness is necessary. "For if I wish

[106] *Regula VII*, Vol. X, p. 388.
[107] *Regula XI*, Vol. X, p. 409. *Cf. Regula VII.*
[108] *Ibid.*, p. 408.
[109] *Regula VII*, Vol. X, p. 389.
[110] *Ibid.*, p. 390.

to prove by enumeration how many genera there are of corporeal things, or of those that fall anywise under the senses, I shall not assert that they are so many and no more, unless I know for certain that I have comprehended all of them in the enumeration and distinguished each from each." [111] In other cases such perfect completeness may however be dispensed with. "But if in the same way I wish to shew that the rational soul is not corporeal, it will not be necessary that the enumeration be complete, but it will be sufficient if I collect all bodies at once into a certain number of classes in such wise that I shall be able to demonstrate that the rational soul cannot belong to any of them. If, finally, I wish to shew by enumeration that the area of a circle is greater than the area of any other figure of equal perimeter, it is not necessary to consider all figures, but it is enough to demonstrate this conclusion for certain particular ones only, and to conclude the same by induction for all the rest." [112]

The last example sounds like an induction in our sense of the term, and perhaps something of the sort is what Descartes, for the moment, really had in mind. But if we remember that the illustration is drawn, after all, from mathematics, we shall be led to wonder whether this be indeed the case. Is not enumeration even here rather an auxiliary to the intuition of universals or simple natures, and of their necessary connexions? This interpretation at least seems to be implied, for instance, in the following passage: [113] "But if we arrange all the particulars in the best order, they will be reduced for the most part to determinate classes of which it will be sufficient to take one only for exact inspection, or some item of each, or some rather than others."

That Descartes' "enumeration" or "induction" is not our induction is also evident from his use of terms. Thus "induction" is used synonymously with "deduction", and to "induce" (*inducere*) for to "deduce" or to "infer". [114] He speaks of enumeration as one kind of "illation" and contrasts it with

[111] *Loc. cit.*
[112] *Loc. cit.*
[113] *Ibid.*, p. 391.
[114] *Cf.* Berthet, *op. cit.*, p. 404, note 1.

"simple deduction" [115] as that kind of deduction "to which we give the name of enumeration or induction". [116] And he tells us indifferently that the two sole methods of arriving at certain knowledge are "intuition" and "deduction", [117] or that they are "intuition" and "induction", [118] and in this passage "deduction" and "induction" seem plainly to be regarded as synonymous.

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[115] *Regula XI*, Vol. X, p. 407.
[116] *Ibid.*, p. 408.
[117] *Regula IX*, Vol. X, p. 400; *Regula III*, pp. 366, 369.
[118] *Regula III*, Vol. X, p. 368.

THESES CONCERNING THE FOUNDATIONS OF LOGIC.

IT is proposed in this paper to outline a number of theses concerning the foundations and principles of logic. The varied tradition of logic and the present-day diversity of views regarding its nature and many of its fundamental concepts might lead one to suppose that there are 'logics' instead of logic. It is not proposed to advance one more 'standpoint'; rather, it is to be desired that standpoints be avoided by investigating the structure of theories and systems as such. Logic as the theory of systems is independent of metaphysical interpretation. An attempt to observe deductive procedure in the presentation of the materials of the present paper would have theoretical advantages of which I am mindful; but there is also much to be said for an order of presentation which takes its departure from the leading traditional divisions of the inquiry. So much is still problematic in the borderline fields of metaphysics, epistemology and mathematics that the broad and detailed discussions of a critical investigation seem more desirable, to begin with, than one more tentative deductive system. Thus the philosophic roots of many of the problems still unsolved will be clarified. The following selection from a larger number of theses is advanced, their fuller elaboration being left for a treatise.

1. The foundations of logic must be investigated in four directions or respects—*viz.*, (*a*) psychologically, (*b*) epistemologically, (*c*) metaphysically, (*d*) formally. The first three name pre-logical spheres for descriptive analysis, and the fourth refers to the basis of logic as a scientific system (or, to use Professor Sheffer's expression,[1] as a system-function). The psychological sphere furnishes the point of departure. It is unavoidable that logic begins with actual thought, even though it does not remain with it. It might be said to deal with thought as *possible* thought. It

[1] *Cf.* H. M. Sheffer's "*General Theory of Notational Relativity*" for a preliminary account of his "superpostulational foundation for logic".

would be better to state that logic deals with *knowledge*, and so avoid confusing the objective of psychical processes with the processes themselves. Knowledge is the objective of thought; and all knowledge, actual and possible, falls within the province of logic. At present there is an advantage in taking this point of departure for purposes of understanding. No one metaphysical view is involved rather than any other—*e.g.*, Husserl's phenomenological treatment in terms of pure consciousness, or Whitehead's ultra-realistic version, according to which mind is deprived of its former preferred status. Disregarding the difference in interpretation between the views of these thinkers, their findings may be seen to exhibit a striking parallelism.

2a. Judging is an *activity*, or one kind of activity, others being wishing, willing, presuming, etc. The notion of 'acts' has been rejected by some investigators, who questioned its empirical justification. But the 'empirical' field may not be so unduly limited. Natural science makes use of the customary 'outer' experience, and its field may be regarded as empirical in a narrow sense. Recent psychology has attempted to embody mental phenomena in that field. Even if it were completely successful in its undertaking, one of two conditions must obtain: either it would include a translation of the terms of the older psychology into those of the new; or a large group of indubitably real psychical experiences would be omitted because incapable of such translation. But part of the immediately given fact of mind is the awareness of a passage in time which manifests itself as the activity of (say) judgment. Whether 'naive' judgments may be made without such awareness may be disregarded here.

2b. For logic, judging is 'noetic', as distinguished from 'subjective'. (Reference is herewith made to Husserl's Phenomenology.) 'Noemas' belong to what will later be called 'substrates'. Inextricably interwoven with the subject of judgment is that of the theory of objects. A description of judgment must of necessity include the reference to objects or an objectivity. The separation of the two fields is made for convenience.

3a. The objective of the logical activity of judging is the *judgment*, which may be expressed in symbols or unexpressed. An expressed judgment is called a proposition. Judgments and

propositions have their own peculiar being, which is relational in character, referring to other modes of being as their object-basis.

3*b*. There may be judgments in hallucinations and illusions, or judgments of so-called 'impossible' entities, etc. This is also a theme for the noematic survey of judgment, or an analysis of the correlates of judgment.

4*a*. A complete act of 'natural' knowing involves the following factors: (*a*) the ego as the pole of reference of any act, whether actual or possible; the ego is a possible ego if the act is a possible act; (*b*) the logical act or judging; (*c*) the judgment or proposition; (*d*) the objects or objectivity indicated by the judgment.

4*b*. A complete act of 'reflective' knowing contains all of these elements as ingredients of the objectiveness it indicates through its judgment. In addition, it involves the reflective ego, the reflective act, and the reflective judgment or proposition. The incompleteness of the perceptual object in 'natural' knowing is seen completely in reflection, which means that there is an essential alteration of the 'objects'.

5. A description of the ego-poles of acts, with their "*Vollzugsmodi*", or modes of performance, as Husserl puts it, furnishes us with one part of the genetic foundation of logic. A descriptive analysis of meaning and related notions yields the co-logical factors. And a theory of objects which investigates the nature of the objectivity indicated is basic to logic.

6. In the pre-logical sphere we have the task to separate out the limiting case of modally unqualified assertion. An (in the sense of 'any') ego *judges simply*, and what is judged is a judgment. A descriptive analysis of such pre-logical factors, a theme to which Husserl has devoted considerable and painstaking attention, yields much of interest to the logician.

7. In logic, as in mathematics, the whole is prior to the parts. In this sense, the number series is 'first'. Through judgment we analyse the whole (here, the number series). Take, for example, the arithmetical judgment $3 > 2$. The number series is co-given as the basis upon which the judgment is made.

8*a*. *Selection* and *abstraction* are displayed in judgment. The selection of a character out of the collective complex of the characters basic to and meant by the judgment is what occurs. Con-

sider, *e.g.*, the judgment 'The tree is green'. 'Green' is a character which has been selected. It has been abstracted as an entity, which, although non-independent existentially, nevertheless possesses a pseudo-existence (as a noema) through being indicated by the constituent term 'green'. There are various kinds of abstraction—extensive, ideal, essential, etc.; here we have what may be called 'real' abstraction. A character is transferred from its natural status of being and isolated as the objectivity at the basis of a judgment. Similarly, in the example $3 > 2$ the number series is presupposed with all of its elements and relations. Certain elements and relations are selected and abstracted.

8*b*. *Limitation* and *exclusion* also characterize judgment. Through judgment, the possibility of the variation of a fact is limited; the range of holding-value (or 'truth-value') is limited. The exclusion of judgment results from its limitation, as may be seen in the following examples: 'This tree is green' excludes the proposition that it is white, etc. '$3 > 2$' excludes that $3 = 2$ or that $2 > 3$. 'It is raining' excludes that it is snowing. 'Centaurs are large' excludes, *e.g.*, that centaurs are smaller than men.

9. Through judgment a *fact* is posited and a *substrate* is presupposed. A *fact* is the correlate of a judgment, or its indication, and is that which makes the judgment true or false. It is thus its immediate and specific basis. For example, '3' and '2' belong to the fact indicated by the judgment '$3 > 2$'. A *substrate* is presupposed, in this case the number series with its relationships. In the example 'It is raining' the substrate which is presupposed is 'the atmospheric condition in general'; and the fact is the present, meant modus of the substrate, or the atmospheric condition as it now is. A substrate does not have to be of a thingish nature; it may be purely imaginary. The smallest substrate is an 'x' as the empty substrate presupposed by an individual judgment. The largest substrate has been said to be the conceivable universe, but the latter is an illegitimate totality. There are conceivable substrates; but there is no substrate corresponding to 'conceivability'.

10. Substrates may be independent of actual experience. Whitehead's challenge of the concept of experience in his recent work on *Symbolism* is timely. Many propositions that are most valuable in science are such that they may not be realised in actual

experience. The intuitionistic demand that there be a view of the infinite (or of an infinite) is unwarranted, for something is presupposed which goes beyond any possible 'view'.

11*a*. The simplest kind of judgment is expressed in pointing (for an individual).

11*b*. Individual judgments are generally only relatively individual. Consider our example $3 > 2$. In respect to the general theory of numbers it is individual; in relationship to the general theory of objects it is a universal judgment. 'That is 2' would be a limiting case.

12. The substrate which is presupposed is capable of various divisions. Through the judgment these divisions are limited, some being permitted (M') and others being excluded (M''). Thus two classes are defined. The negation of a judgment arises through the formal interchange of M' and M''. We have referred to the substrate which is presupposed by '$3 > 2$'. The cases $3 = 2$ and $3 < 2$ are not there, and the judgment states that. Negation must involve objects, even if from another substrate; and there must always be a fact basic to the negative judgment (the complementary fact). The example $3 \not< 2$ is thus clear. Limitation and exclusion are primitive ideas, and are descriptively founded in experience. The preference of one class is the primitive operation, and that occurs in assertoric propositions, to begin with. Thus one constituent of negation is already involved in limitation. Objects cannot be negated; propositions are negated. Consider the case of $+i$ and $-i$, which are not to be distinguished by any essential characters, and yet differ in their relationship. It is similar with positive and negative judgments. In the judgment p, the characters of class A (M') are admitted, and class B (M'') is excluded as the complementary class. Through the judgment $-p$ the characters of B are admitted, and A is excluded. Thus the relationship between p and $-p$ is one of interchange.

13. A *question* has in common the assertion and negation of a judgment. A character is selected from a complex, but no decision is made. An exclusive disjunction is determined. This gives an object-basis for disjunction and negation. The negative judgments are here on the same plane as the affirmative. The

essence of negation consists in the mutual relationship of two propositions which correspond to the same disjunction or judgment-question, but in which the class of admitted and excluded characters (or possible characters) are exchanged.

14. In a false judgment there is disagreement between the judgment-meaning and the fact—*e.g.*, '9 is a prime number'. In a true judgment there is agreement between the judgment-meaning and the fact.

15. The term 'intention' refers to the knower; he may 'intend' rightly or wrongly. All objects have significance in general. As members of an ordered domain they acquire specific *meaning*, which may be abstracted through judgment. A proposition is thus a preferred meaning. The objects basic to the proposition are its *indication*. The meaning of a judgment involves the function of division; it consists in the division of the possible modi of a substrate and the preference of one class, under which it is ordered. Its indication is the fact that makes it true or false.[2] Thus meaning and indication are logically distinguishable and independent of one another. The meaning of a concept consists in its determining character; its indication, in the class defined through the concept.

16. The concept of *objects* must be clarified. Substrates consist of ordered or related sets of objects. We may speak of *domains* of objects which do not possess specific order; there must, however, be a minimal order without which objects would be unthinkable. The domain of 'something in general' has been spoken of as the largest possible domain, and it has been supposed that all possible objects are included in it. But such a domain may not be constructed without contradiction. We may ask, what is the structure of an object in general? An object is, in the first place, a unique something for which the principle of identity must hold. An individual object has a differentia as well as a generic essence, and is thus the basis of a complex judgment. An object exhibits a synthesis of identification when viewed from the cognitive side. It may be said that an object *qua* object-of-knowledge displays such a synthesis of its aspects. Physical objects involve an identity in space-time; memory objects, in time. A table, *e.g.*,

[2] *Cp.* with Russell's discussion of Frege in his *Principles of Mathematics*.

is an identity in space-time, together with the various strata of qualities (primary, secondary, etc.) which go to make it up. Thus viewed, an object is an essence, the invariant of its givenness. It might appear that if the givenness is regarded as a process, mathematical objects are excluded from our account. That does not follow, however, as further consideration shows. All objects, including mathematical 'things', are or may be 'given' as objects of knowledge, hence as involved in a process through which they persevere as the same identities despite the flux of attention, variations in symbolic expression, etc. We may distinguish between basic and specified objects. Objects *qua* objects of knowledge display a synthesis of identification basically. On the other hand, we may operate formally with specified objects, which do not have to be brought to givenness; and if they are, they have a two-fold unity or uniqueness.[3]

In order to find the objectiveness of anything, its invariant must be determined. That is formal and gives us what is identifiable. In a natural object the invariant of the various forms of appearance, or of givenness, is determined. In a personality it is the invariant of the development of an individual life-continuity in its temporal development which must be ascertained. Consider the following cases: tree, 2, centaur, personality, Julius Caesar. What these have in common will give the minimum for an object as such. The number 2 as a specified object is the invariant of equivalent aggregates, or an invariant of a higher order. To put it otherwise, a number is the characteristic feature which an aggregate has in common with all the aggregates which may be placed in one-to-one correspondence with it. 'Class' could be regarded as this feature, but that is not necessary; the content is more important than the external form. In the case of numbers a domain of objects is presupposed. Arithmetic presupposes the concept of 'object', which it does not define. This is the case in mathematics in general; it operates on a higher level, being an extension of logic, and does not need to concern itself with such a

[3] *Cp.* with Whitehead's *Principles of Natural Knowledge*, in which he speaks (p. 82) of "the primary recognition which is the awareness of permanence within the specious present". *Cf.* also Husserl's *Logische Untersuchungen* for a similar judgment—*e.g.*, vol. 2, pp. 99 f. (Halle, 1922.)

fundamental question. Therefore arithmetic may not be used to define the concept of objects.

There is no talk of substance in logic; objects alone interest us. In the examples 'Grant was the Union general' and 'Grant was President' the same object appears as basic to different judgments, in different forms of appearance. That Grant was a substance does not enter into question. The theory of objects must give an account of sameness, structures, variable objects, uniqueness, essence, existence, etc. Logic does not have to concern itself with existence as such, but rather with the form of existence. We may add a word concerning symbols. Symbols may be regarded from their physico-chemical side, which displays an ideal unity or synthesis of identification, and from their ideal side of meaning. A symbol has a structure, which is its material essence; it can vary physically, but only within certain structural limits, which if varied too much violate and falsify the symbol's essence. It may be said that a symbol is a structure with no more meaning than that which is involved in (*a*) the synthesis of its various modes of givenness into a unity, (*b*) the characters which determine its limits of variation, and (*c*) the attachment of this structure to a definite meaning in a sphere of knowledge. The formal structure of symbols, or the specified structure, is determined by the rules of connection between the symbols. The specified structure is a variable and may be interpreted in various ways.

17*a*. Propositional functions only have meaning when defined with respect to domains. It would be meaningless to set up a propositional function for *any* elements, for what will later be called 'system-strange' elements could then be introduced. For example, the concept of color, or being green, should not be connected with the number 3. Propositional functions arise through the attribution of the same character to different objects. They can only define classes within a domain for which they are meaningful, and this requires the principle of excluded middle. The 'class of all classes' may be shown not to belong to the original domain. Classes are formed by propositional functions, there being always the class of those elements for which the function is true or holds. 'X belongs to domain D' determines the largest class, which is identical with D, as does '$x = x$', which must hold

for every object. A propositional function which is false for all elements determines the null-class—*e.g.*, '$x \neq x$', which is always false according to the theory of objects. Or, 'x does not belong to its own domain.' The collection of all classes forms an aggregate which is not identical with the original domain; it has a higher 'power'. We say here *classes* of the domain, and not elements of it; the classes thus form a new domain, although determined by the original domain. The contradiction of the class of all classes which are not members of themselves [4] arises only if one assumes that the classes are elements of the domain. But classes may only be formed within a domain; and our starting-point is not the domain comprising all classes, and especially the class of all classes which are not self-membered. We begin with domain D, and then form K, which comprises all classes of D. A sub-domain of K is K', or the classes not containing themselves. D is here taken as containing objects of some determinate sort. Classes might belong to it, but it is not necessary to introduce complications. K' does not have to belong to K or D as an element; it is just a *part* of K. And further, the classes of K' do not have to belong to K or D as elements. The following general proposition is basic: Every domain D contains at least one sub-domain which is not an element of D.[5]—Furthermore, the idea of a domain of all that is conceivable is illegitimate; for all its sub-classes would constitute a new domain with a higher power. A domain must always be limited. The conceivable universe may have to include nonsense, but it is the business of logic to exclude it. 'In the beginning was exclusion', we may say for logic. There may be any number of conceivable systems, but there can be no 'system of conceivability' if we are to avoid contradiction.[6]

17*b*. It would have little meaning to assert universal and particular judgments concerning a domain. A domain is always presupposed with content, it is taken as being non-empty. But a part of the domain, or a class, might be empty. A particular judgment signifies that its negation is not true for all elements of the domain.

[4] *Cf.* Whitehead and Russell, *Principia Mathematica*, Vol. 1, p. 60 (2d ed.).

[5] *Cf.* Zermelo, *Grundlagen der Mengenlehre*, Math. Annalen, 1908, pp. 264 f.

[6] *Cp.* with W. E. Hocking, *Mind and Near-Mind* (Proceedings of the Sixth International Congress of Philosophy, p. 210), in which he states "This logical world of all the meanings is but another term for chaos."

'Some groups are infinite' means that such groups can be formed without contradiction. 'Some numbers are prime' defines a non-empty class. The Fermat proposition determines a class which is believed to be empty, although the proposition is reasonable. In the example 'All trespassers will be prosecuted' the class may be empty; but the domain of persons is not empty, for otherwise the proposition has no meaning. The concept of existence may be applied only to well-defined classes of a non-empty domain. The meaning of an existential judgment is that a well-defined class of a domain is not empty. But we do not say that the *class* exists. The class of black horses does not exist, but rather the black horses themselves. If the class is not empty, its *elements* exist. The proposition 'There are no centaurs' means that the class of such beings is empty in the domain of historical reality. But there are centaurs in the domain of painted things. The proposition 'Some horses are not black' means that the complementary class of black horses is not empty. If we proceed from domains it is clear that to every class there corresponds a complementary class. Every non-empty class may be chosen in turn as a domain. But an empty class may not be so chosen.

18. The special sciences have limited domains or fields of validity. Ideally at least they may be represented by postulate sets which stand for all the propositions (or propositional functions) making up the science in question. When postulational properties may be formulated a science becomes a deductive system. Each system uses logic, or carries logic along with itself. The fundamental principles of logic must be assumed by all systems. Examples of the assertion of a proposition in system A and of its negation in system A' indicate the limited application of the principle of contradiction. Euclidean and non-Euclidean geometry may be cited as an example. A larger system may be constructed in which the two (or more) sub-systems have merely relative validity. Thus a collective system may be built up out of apparently contradictory elements. In pre-Euclidean geometry we have a system founded on all the postulates with the exception of the parallel postulate. The proposition that the sum of the angles of a triangle is equal to two right angles does not hold, nor does its opposite. This geometry comprises both the Euclidean

and non-Euclidean systems. To be consistent, it may not say anything about the sum of the angles of a triangle. And similarly, the general theory of groups must comprise both finite and infinite groups; there one may not say anything about finitude or infinitude. In the general theory of groups the proposition that every group is finite is false. The various special systems, on the other hand, add new determinations through special postulates. A collective system of knowledge seems possible, and in it the postulates of the special sub-systems would have only *relative* validity. This is obviously different from the rationalistic ideal of a single unified system of knowledge. In the case of the factual sciences it is supposed that there is a reality of facts which do not involve contradictions. The historian does not regard his propositions as being relative. A collective system of knowledge would have to comprise both factual and formal sciences. But they have different foundations, the investigation of which is important for the general theory of science.

19. Let us now consider the principle of excluded middle. It defines a property of substrates in that it requires all predicates attached to objects in the domain to hold or not to hold. This principle is a necessary character of substrates as such. At least one of the alternatives, p or not $-p$, must hold, which is the new requirement added to the principle of contradiction. That is to say, if p is any proposition in a given system ('system' is here used in a general sense), and not $-p$, its negation, then either p or not $-p$ must hold. That both may not hold follows from the principle of contradiction. It states that at least one of the alternatives must hold and thus determines a general disjunction, which by virtue of the principle of contradiction is exclusive. The question arises whether this principle is generally valid, or whether it must be limited. In the first place, meaningless propositions must be excluded, for their negations are just as meaningless—*e.g.*, 'The number 3 is green.' It may also be asserted that it is not green. The proposition 'A duldul is a gulgul' is not true, nor is its negation. The cases 'A duldul is a duldul' or 'not a duldul' might seem exceptions, but they are meaningless and should be excluded. We may say, in the spirit of William James, that philosophers ought only to consider propositions which are at

least false. A second limitation which must be imposed is that propositions not belonging to the system or not having anything to do with it are to be excluded, together with their negations. In other words, system-strange propositions are excluded. Thus we must determine for which propositions p within a certain system S the principle is applicable. It has always a limited (with respect to propositions) and relative significance (with reference to a system). The propositions for which it is valid make up a system. The Fermat proposition is either true or false within the system of elementary arithmetic, but we do not know yet which it is. We might attempt to build up the system of arithmetic by setting up all valid propositions, but we could never complete it in that way. It may be defined by postulates, from which the propositions can be derived. We know that they hold or do not hold.—Let p_0 symbolize system-strange propositions (meaningless and irrelevant propositions); p_1 names the system-proper or the valid propositions; and p_2 are the system-false propositions, the negations of $p_1 \cdot P_1$ and p_2 may be called system-related propositions. Thus we have a ternary disjunction of propositions with respect to a given system. The principle of excluded middle holds only for system-related propositions. But what is the criterion of the delimitation between system-proper and system-strange propositions? That is to be settled in each special system.

The principle of excluded middle presupposes a substrate, or a system of objects and relations with a particular structure. There are systems of objects and relations of such a nature that each of the relations formed from them either holds or does not hold for any of the objects. The system which has this property is called a substrate. A domain is the collectivity of objects, delimited in some way, and comprising the field of variation of its objects. New propositions can be obtained formally and are determined as holding or not holding. The application of this principle does not depend upon our ability to determine it. Take any two numbers x and y; then $x < y$ or $x \not< y$. Such are propositions derived from the fundamental relations which determine a domain. But we may not use a predicate strange to the system. It may be said that the principle of excluded middle refers to *questions:* is a question meaningful within a substrate?

A system of propositions which are consistent may be called a scientific system or *theory*. The principle of contradiction must hold for all theories. Propositions can be constructed from the essential relations of a substrate and so form a theory, which may be represented by postulates. In a theory the propositions are finished, whereas in substrates the form of propositions is given, and more can be constructed. In other words, there is the *possibility* to form propositions. All that can be said about the whole numbers, for example, forms a theory. The expression 'complete theory' might be paired with that of 'substrate'. A complete theory is one which uniquely answers all questions derived from the basic relations. A complete history would be such that all questions concerning it could be answered. Other considerations regarding such concepts as isomorphism, categoricalness, etc., arise at this point, but we can only mention them here.

What has been said suggests a philosophy of logical relativism. In reality we never meet with absolute completeness. A theory may be complete only with respect to relations of a certain kind, so that only questions of a certain kind may be raised. All completeness is relative, there are always questions that a theory cannot answer.

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IS MATHEMATICS A 'DEDUCTIVE' SCIENCE?*

BY all odds the greater number of those interested in the subject would undoubtedly declare that mathematics is a deductive science. What they would mean by such an assertion, however, would be found, as we shall try to show presently, to vary considerably from man to man. And of course there has always been a fair amount of contrary opinion—certainly more than enough to warrant our raising the question as to whether the majority view is correct. Among mathematicians, for example, there are 'intuitionists' like Kronecker and Brouwer (the latter of whom maintains that "logic is based upon mathematics and not *vice versa*"), to say nothing of other rebels like Poincaré and Weyl. Incidentally, the prestige of these names is enough to dissipate the layman's fond belief that in the sciences all is agreement; that only in philosophy is there no unanimity of opinion. Logicians, too, of the most diverse outlooks and interests, now and again venture to depart from the orthodox belief. Besides Mill, the names of Wundt, Brunschvicg, Johnson, Bosanquet, Hölder, and Hobson represent a minority strong enough to support a real opposition to the most carefully nourished tradition.

In what follows we do not propose to compare or contrast the views of these several authorities—instructive as such a polemical exercise in logic and metaphysics might be. We shall endeavor, instead, to specify four distinct senses in which the term 'deduction' is actually used, and then we shall try to determine for ourselves the nature of mathematical inference.

1. There is, first, the vague sense of the word, which really tends to equate deduction with inference in general. Both in every day speaking and writing, and in legal, historical and even scientific literature one encounters such phrases as, 'from these facts I deduce the following propositions'; 'from these accurately

* Read at the twenty-eighth annual meeting of the American Philosophical Association (Eastern Division), at Philadelphia, December 28, 1928.

verified observations X deduced the law of so and so'; 'you cannot make such a deduction from the given premises'. Such loose expressions doubtless serve the immediate purpose of the speaker or writer, and they need not mislead the critical student of logic. Evidently something else must be meant as a precise description of the nature of mathematical reasoning.

2. Secondly, we have the extreme doctrine which identifies pure logic and pure mathematics as the science of deductive reasoning on any subject—and consequently on no definite subject at all—a doctrine of absolute formalism. Certain contemporary mathematicians and logicians ardently support this thesis, and it may be said to be *the* fundamental assumption of what calls itself mathematical logic. Starting with a minimum number of thoroughly abstract ideas and propositions, whose meaning is supposedly determined or defined by pure thought without reference to experiential data, mathematical logicians have fancied that they could 'deduce' all of pure logic and pure mathematics, according to the very principles or postulates which constitute their premises. Thus, "for example", for certain members of this school of thought, "the notions of mplication, alternation, disjunction and negation are formal"—*i.e.*, have no material content—"and of these we may take negation and alternation as understood without definition, while the others can be defined in terms of these two."[1] And in his *Introduction to Mathematical Philosophy* Mr. Russell enunciates the five "formal principles of deduction employed in *Principia Mathematica*". He then goes on to explain that such "a formal principle of deduction has a double use. . . . It has a use as the premiss of an inference, and a use as establishing the fact that the premiss implies the conclusion. In the schema of an inference we have a proposition 'p', and a proposition 'p implies q', from which we infer 'q'. Now when we are concerned with the principles of deduction, our apparatus of primitive propositions has to yield both the 'p' and the 'p implies q' of our inferences. That is to say, our rules of deduction are to be used, not *only* as *rules* but *also* as substantive premises. . . ."[2]

[1] *Cf.* Johnson, *Logic*, II, p. 139; Mr. Johnson himself is critical of this procedure.
[2] *Op. cit.*, p. 150.

On some such basis, now, the mathematical logician imagines he can rear the entire structure of deductive reasoning.

That this is an attractive, a fascinating prospect, even our necessarily inadequate indication of its nature makes evident. Reasoning reduces to a mechanical game with pre-determined and self-perpetuating rules of procedure. Unfortunately, however, a single observation is enough to burst this intellectual bubble. That is to say, it is simply impossible that the establishment and justification of a process of scientific reasoning should be accomplished by means of that very same process itself. Before we can consider the possibility of deductive processes 'from logical principles according to (the same) logical principles', some independent way of determining the validity of such principles must have been provided. To say that they are arbitrarily assumed or intuitively apprehended is simply and flagrantly to evade a fundamental issue. Obviously a vicious circle must result from the attempt to derive pure mathematics from pure logic by deduction understood in this fashion. And that Mr. Russell has forgotten his own argument in this regard only serves to confirm our observation. In speaking of the significance of the so-called principle of induction our authority remarks that "those who are interested in deductive logic naturally enough ignored it, while those who emphasized the scope of induction wished to maintain that all logic is empirical, and therefore could not be expected to realise that induction itself, their own darling, required a logical principle which obviously could not be proved inductively. . . ." [3] In our own words, you cannot prove the principle of induction according to the principle of induction. Here Mr. Russell is merely applying to a particular case, the general rule, that you cannot argue in a circle, and hence he can hardly blame us for refusing to permit him to ignore the same rule in his own case. At bottom these are the same old difficulties which in an earlier age proved insuperable to those who desired to employ the principle of the syllogism, so-called, as the major premise of syllogistic demonstration. Just as the 'principle' was found to do no work in actual cases of inference, so it would seem that the mathematician

[3] *Scientific Method in Philosophy*, pp. 222, 223.

must after all determine for himself both the content of his science and his methods of reasoning. It seems safe to assume that no arbitrarily devised ideas and fixed rules of procedure can take the place or execute the purposes of the hard labor of the intellect,—either in the field of mathematics or anywhere else.

3. Again, we may mean by the assertion that mathematics is a deductive science simply that no reference is made, in the course of our reasoning (or 'demonstration') to physical matters of fact, either for purposes of verification of our premises or as data upon which to base our subsequent inferences. In other words, we presumably reach our conclusions by sheer reasoning on 'ideal' (*i.e.*, non-presentative) data. And thus we may contrast mathematics with the physical sciences, which clearly do need perceptual data both for verification and for elementary material with which to begin. Such, for example, is the view of those who, like Sigwart, maintain that the data of at least the most elementary mathematical inference are derived from observation of our own mental processes (in so far as these processes follow logical rules).

From this point of view the principal task of the mathematician is to scrutinize previous cases of deductive inference with a view (*a*) to the more and more precise and explicit formulation of all his premises, and (*b*) to rendering his deductions absolutely rigorous and flawless. The ideal goal would have been attained, with regard to (*a*), when it could be shown that every premise was entirely explicit and contained only thoroughly lucid ideas, and that no idea or premise was superfluous or inconsistent with the other ideas or premises. And absolute rigor of deduction would mean a process of reasoning which revealed those consequences, and only those, which followed with internal necessity from such premises, and from them alone. This would be 'pure' mathematics indeed—a body of knowledge characterized by complete certainty and *a priori* conclusiveness. That this third view has much in common with that described in the preceding section (2) will be readily perceived. It differs only in the important respect that it ascribes a definite content to the science of mathematics; for example the content consisting of the observed operations of our own understanding, or the

intuitively apprehended content defined in Hilbert's system of 'metamathematics'. But now, clearly, our discussion threatens to get out of hand; our original subject was the nature of mathematical inference, the form rather than the content of the science. And even if we admit that form and content, method and object of reasoning, are in some sense interdependent, we must learn to distinguish between them, though we may not separate them. Of course you might argue that *since*, or precisely *because*, mathematics is a science with no content other than that supplied *a priori* by our own mental operations, or whatever is intuitively apprehended, it follows at once that its procedure is necessarily deductive. This argument, however, will appeal only to those who have somehow convinced themselves of the validity of its premise—a proposition we have very good grounds and authority for believing to be false. The science in fact would seem to have a very well-defined content, namely the quantitative features of the actual world of perceptual experience. Such at least is what Professor Whitehead maintains when he asserts that ". . . the leading characteristic of mathematics [is] that it deals with properties and ideas which are applicable to things just because they are things, and apart from any particular feelings, etc." These properties are "the abstract formal properties of things."[4]

4. We come, accordingly, to a new way of raising the issue. So far we have been dealing only with men-of-straw arguments, *i.e.*, with obvious misconceptions, or with a confusion of problems. But we shall be asked if we really propose, after all, seriously to contend that mathematics is anything else or other than a deductive science in some sense now at last to be correctly defined. Surely it is a commonplace, which hardly deserves mention in enlightened circles, that in mathematics there is no problem of inferring from *some* to *all* instances of the occurrence of a certain property or phenomenon. Once granted that the process of mathematical induction, or of reasoning by recurrence, is not induction in the logical sense of the word, what is there genuinely inductive about the science? What is there in mathematics which corresponds to the procedure of the physicist in

[4] Whitehead, *Introduction to Mathematics*, p. 13.

inferring, from the experiential data that *A*, *B*, *C*, . . . are phenomena which obey a certain law, to the generalization that all such phenomena obey the same law? In mathematics, on the contrary, to demonstrate a property of this circle is *ipso facto* to demonstrate it of all possible circles. Because the circle is not a sense-object but an ideal conception, *the* circle and *all* circles are one and the same, and what is true of the former must be true of the latter. And clearly where there is no induction all inference must take the form of deduction.

Just at this point, however, a sudden doubt assails us. Our friend the physicist objects that unless he is greatly mistaken the law of gravitation (to repeat our earlier example) does not say what we as laymen have naively taken it to mean. It does not say 'all bodies gravitate' and the process by which it was arrived at was not a matter of summation of instances at all. What it does mean is that the material universe is a system of elements interrelated in such a way that each element attracts every other element with a force which is directly proportional to the masses and inversely as the square of the distances involved. The inference (to repeat what we have said (elsewhere)) is not from some to all members of a class, found to possess a common property, but from data regarding the behavior of certain apparently unrelated and quite dissimilar objects or phenomena (such as a falling stone on the surface of the earth, the motion of the moon in its orbit, the tides, the rising of a balloon) to the formulation of a general law which binds these diverse objects or phenomena together in a system.[5]

Now Cassirer gives an illustration, taken from the theory of numbers, of a process of inference which accurately parallels this instance of induction both in result and—significantly enough—in the fact that it lends itself to an interpretation conforming to the traditional empirical conception of the nature of inductive inference. "If we take the series of square numbers as given, then . . . we can establish purely empirically the fact that the differences between the individual members can be

[5] *Cf.* Hoernlé, "Proceedings Int'l Congress of Philosophy", 1926, p. 267: "Knowing begins with finding miscellaneous differences simply together. It passes on to find connections between them such that one cannot be without another, or such that given one another must be."

represented by the progressive series of the odd numbers, 1, 3, 5, 7, ... On the basis of this fact, we may expect that when we proceed from the last given member of the series of square numbers, and add the corresponding odd number to this member, that a square number will result; but nothing justifies us in taking this psychological expectation as the same as a logical necessity. No matter how many members have been tested . . . it always remains possible that at a certain point the previously constant type of progress may be broken off. No accumulation of observations regarding particular numbers, no matter how great, could ever enable us to reach a new form of certainty, that would give us more assurance in this regard."

At this point it is convenient to pause for a moment in order to compare the reasoning, so far, with that of the empirical logician, concerning an admittedly inductive inference. "If Hume's account of causation is the last word," says Mr. Russell, "we have not only no reason to suppose that the sun will rise tomorrow, but no reason to suppose that five minutes hence we shall still expect it to rise tomorrow." But that we do suppose the sun will rise again is a plain fact, and must be accounted for, according to the same authority, in virtue of the 'principle of induction'. Namely, "if, in a great number of instances, a thing of a certain kind is associated in a certain way with a thing of a certain other kind, it is probable that a thing of the one kind is always similarly associated with a thing of the other kind; . . . ." Just as in the case of the sun's rising, so in the case of the number series, all we have, so far, is probability, psychological expectation, not genuine logical necessity. But if this be so, and if induction leads to such results in the one case then it would seem that it was presumably responsible for the same results in the other case; in other words, on the empiricist's own argument mathematical reasoning appears to present an inductive aspect.

But, of course, as Cassirer immediately goes on to say, we do advance from probability to a "new form of certainty", which is to be gained, he maintains, "when we proceed from the 'universal' member of the series, *i.e.*, from its law of construction, rather than from the enumeration of its particular members.

The formula $(n + 1)^2 - n^2 = 2n + 1$ shows at one stroke, and without the necessity of several tests, the constant and necessary relation, that subsists between the progressions of the square numbers and that of the odd numbers. The totality of square numbers and that of odd numbers are now taken up into one system, in which the one is known *through* the other, while hitherto, no matter how far we traced their reciprocal correspondence, the two were merely in conjunction." [6] This, plainly, is analogous to the reasoning in the case of gravitational phenomena, and at once suggests how to deal with Mr. Russell's difficulty, in the case of the rising of the sun. Namely the movements of the sun also belong to a system, between the members of which there exists a 'constant and necessary relation' just as in the case of the members of the number-system. To paraphrase Cassirer's argument, the totality of members of the stellar universe are now taken up into a system, in which the movements of the one are known through the movements of the other, while hitherto, no matter how far we traced a reciprocal correspondence, such as the rising of the sun, with a certain other phenomenon, the two phenomena were merely in conjunction. And if we mistake the method and aim (as, for example, of reasoning from 'one' or 'some' to 'all') of inductive inference with regard to physical phenomena, the same mistake would sometimes seem to be equally possible in the domain of mathematics.

The foregoing considerations suggest that we should maintain an open mind as to the nature of mathematical inference, at least until we can examine whatever evidence commends itself as objectively valid. As we have remarked elsewhere, our appeal must be to the history of the science in question; there is obviously no other material available which will satisfy this criterion. We accordingly invite attention to the following historical details, the accuracy of which any reliable work on the history of science will verify.[7]

[6] Cassirer, *Substance and Function*, Eng. transl., p. 262; Russell, *Scientific Method in Philosophy*, pp. 221, 222.

[7] In this connection *cf.* Poincaré, *Foundations of Science*, p. 386: ". . . the mathematical facts worthy of being studied are those which, by their analogy with other facts, are capable of leading us to the knowledge of a mathematical law just

One of the problems confronting Egyptian mathematicians was that of fractions and their expression as sums of fractions with the number one as a numerator. For them it was necessary to establish empirically, *i.e.*, in special cases, that $2/3 = 1/2 + 1/6$, or that $2/5 = 1/3 + 1/15$, etc. Only when a sufficient number of such cases had been determined could the general rule governing the necessary operations reach its formulation. Indeed, these early Egyptians never succeeded in solving these problems according to any one single rule. Another early problem, of geometry, was the calculation of the area of a quadrilateral plane figure in terms of the lengths of its sides. In the case of a square (of length of side a) it was easy to discover that its area was $a \cdot a$, or a^2. Analogously, it was easy to find that in the case of *any* rectangle of sides a and b, the area was given by the product of $a \cdot b$. An attempt to generalize still further, in this particular case, at once illustrates a weakness of analogical reasoning, and confirms the analysis of this procedure as essentially inductive. Namely, the area of an isosceles triangle ought to be $a \cdot b/2$. History also informs us that the ancient geometers first proved the general proposition that the sum of the three angles of a triangle are equal to two right angles independently for each particular kind of triangle, the equilateral, the isosceles, and finally the scalene. And a similar development took place in the case of the Pythagorean theorem.

These simple examples could be multiplied indefinitely, but it may be more imposing to turn for further evidence to more important theoretical constructions of modern times.

Consider, for example, the contributions to the science of mathematics in the seventeenth century, contributions which were largely the work of Kepler, Cavalieri, and Descartes. For the Greeks geometry dealt with various separate and independent types or kinds of figures; mathematics was still more or less at the classificatory stage of its development. Thus a rectilinear figure was sharply distinguished from a curvilinear one. Even the kinds of curves were conceived as each independent of the others; however distant one focus might

as experimental facts lead us to the knowledge of a physical law. They are those which reveal to us unsuspected kinships between other facts, long known, but wrongly believed to be strangers to one another."

be from another an ellipse was still an ellipse; and all figures were finite and represented in perception. Now Kepler's introduction of the notion of infinity into the science changed all this. Thus he considered a circle to be composed of an infinite number of triangles, having their common vertex at the center and forming the circumference by their bases. Such a conception can no longer be adequately pictured, but it leads to the representation of it by an infinite numerical series whose sum is finite. This promise of a connection between geometry and algebra was made good by Descartes in his analytical geometry. And finally, for Newton and Leibniz, many geometrical magnitudes are seen to be capable of generation out of one another by the 'principle of continuity'. We explain or understand such separate figures as parabolas, ellipses, circles, etc., by relating them as members within a system, in this case of conic sections, and by deriving them from a common ground or law of generation. History further reveals how out of scattered and very extensive investigations of special differential equations a general theory of such equations gradually evolved. And elliptic functions; the potential function; the functions of Legendre, Laplace and Bessel, all treated under the general term of 'harmonic' functions; Euler's 'gamma' function; Jacobi's 'theta' function; were all treated independently before a general theory of functions was thought of.

These examples (which could be multiplied indefinitely) are obviously strictly parallel to developments in the physical sciences which everyone recognizes as unquestionably illustrative of the inductive aspect of inference in that domain. It would seem incontestable, therefore, that mathematical reasoning, like other reasoning, when examined objectively, presents features or aspects which can only be consistently described as inductive in nature. The characterization of mathematics as a purely deductive science accordingly reveals itself as the result of an uncritically accepted tradition, coupled with certain 'metaphysical' preposessions, such as that of the ability of 'pure' thought to generate out of itself, wholly apart from 'experience', results of real significance. It is now time to pause for a moment in order to consider certain of the more important implications of this conclusion.

It will be recalled that the question as to the truth or falsity of mathematical propositions is for modern students of the subject a very perplexing one. Only one thing seems certain; namely we can no longer maintain that such propositions are true absolutely. In fact, the view that they are neither true nor false, but 'conventional'—*i.e.*, the logically implied consequences of purely abstract, arbitrary assumptions—appeals to a considerable number of thinkers as a well-established fact. And if it were true that we had to do with a wholly formal and wholly deductive process of reasoning this interpretation could hardly be avoided. But with a recognition of the place of the inductive aspect of inference in mathematics, it is possible to consider another alternative.

With regard to any one proposition we must learn that its truth or falsity can only mean its coherence with other propositions in a theoretical structure, and that such qualities never, in any science, reside in a single proposition taken by itself alone. '$2 + 2 = 4$' is an example of what we sometimes carelessly call a brute fact, on a par with other facts in the various sciences, such as a simple chemical formula. Such statements are true, not absolutely, but only because of the possibility of deducing them from the theoretical principles of the systems to which they respectively belong. In the course of the development of the science of numbers, say, it remains in some sense a fact that '2 and 2 make 4', but the meaning of the factual proposition alters with each important theoretical advance, as is evidenced by the circumstance that the deduction or proof of the proposition must alter correspondingly. Another easy illustration of the difference induction makes in deduction comes from plane geometry. The proposition that the three angles of a triangle are equal to two right angles was, as we saw, first proven independently for each type of triangle. And in the case of the isosceles triangle the proof involved the use of the fact of the equality of the opposite sides. But the general proof of the proposition must, of course, disregard such particular characteristics of an isosceles triangle; and must instead be based on the more fundamental properties of any triangle.

And similarly with regard to any one type of geometry;

Euclidean Geometry was never absolutely true in the sense in which certain philosophers conceived it to be, owing mainly, perhaps, to its seeming stability. Neither is it now correctly interpreted as a merely 'conventional' system of definitions, postulates, and their formal consequences, telling us nothing about the real nature of space. The truth lies between these extremes. The researches of mathematicians and other scientists are simply demonstrating that no one system of geometry can exhaust the richness of content included in the general field of their investigations. Old elements prove capable of entering into new and hitherto unsuspected relationships, and new elements are naturally brought to light in the same process of development. Euclidean geometry, then, as one type of geometry, among others, tells us something, but not all, about space and the possible relations between spatial elements or objects such as points, lines, and figures.

All this goes to show that those thinkers who share Mr. Russell's sometime view that induction is only a passing phase of scientific inference, that ideally all science is, or would be, deductive, are misled by their idealism to neglect the progressiveness which is an integral characteristic of all human knowledge. Indeed, even deduction is understood by most thinkers who describe mathematics as a deductive science, as a linear, quasi-mechanical process of subsumption of the less general under the more general. But this, of course, so far as it holds at all, is of only subordinate significance. Along with the 'some-to-all' theory of the nature of induction we must give up the 'all-to-some' theory of deduction. In mathematics, at least, construction, rather than subsumption, is a principal means by which inference proceeds. A construction permits either the establishment of new relations among elements (of figure or equation) which were to begin with isolated, or the introduction of new elements (*e.g.*, by a process of substitution). As simple illustrations of such constructions one thinks of the line drawn through the vertex and parallel to the base of a triangle, in order to prove that the three angles of a triangle are equal to two right angles, and of the substitutions of new terms in an equation made possible by the law that $(a + b)\cdot c = a\cdot c + b\cdot c$.

And even in immediate inference probably and in the syllogism certainly similar processes have their place.

Of course it may be urged that these constructions merely serve the purpose of external aids to fix attention and support a failing memory, thus saving us from incoherence, forgetfulness, and too severe mental effort generally. Figures, graphs, symbols, simplify the notions, facts, and relations in such a manner that the mind, relieved of an infinity of detail, can grasp relationships of greater complexity and comprehensiveness. But while all these things may be true, they fail to bring out what after all is the essential function of the construction. Namely, this function is an expression of the fact that our minds operate throughout by means of ideas, representations, symbols, which derive their meaning from that real world to which they ultimately refer. And thus we are able to account for the genuinely new results obtained by deduction—something which on the view which identifies deduction with subsumption is inexplicable.

This analysis of the general nature of mathematical inference enables us to understand the significance of the point of view represented by the intuitionists—*i.e.*, those who insist that besides the faculty of deductive reasoning an intuitive faculty has a necessary function to perform in the mathematical sciences. Namely these thinkers are right in maintaining that something besides deduction must be appealed to in order to account for the results which they obtain. But they express their intuitive conviction in the outworn language of a faculty psychology, and hence they fail to grasp the essential unity of the reasoning process in and through all its aspects. Following the line of least resistance they make a difference of aspect—induction and deduction—into a hard and fast difference of kind—intuition and thought. Surely the example of Kant should have preserved us from such a misguided doctrine!

And finally, our recognition that in mathematics as elsewhere inference possesses this twofold character, accounts for the further fact that in mathematics as elsewhere, history reveals a rhythmic succession of stages of development. Periods of specialization during which particular problems arise and receive their inde-

pendent and special solutions are regularly followed by periods of unification during which these special problems are shown to depend upon some general principle, underlying, it may be, entire provinces of detailed investigation.

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THE CONTRAST BETWEEN INFERENCE AND PERCEPTION.

I PROPOSE to do two things in this article. The first is to describe our ordinary way of contrasting inference with perception in ordinary thought. The second is to give reasons for thinking that our knowledge of the perceptible world is all direct knowledge and none of it indirect knowledge, and that any inference with regard to the perceptible world is a probable and not a certain inference. But this is a big subject, and I shall only deal with a small part of it.

My first aim is to describe our ordinary way of contrasting inference with perception in ordinary thought. This description falls into seven parts, of which the first will be simply the assertion that the contrast I am describing does really occur in ordinary thought.

1. We contrast inference with perception in ordinary thought, and feel that we are thereby describing two different ways of learning or trying to learn the same fact. For example, we contrast the state of Phyllis in the music-room, who *perceives* that it is John who is playing the piano, with that of Arthur in the garden, who only *infers* from certain indications that it is John. Here the fact that Phyllis and Arthur learn or try to learn is the same fact, but they have different methods. Phyllis uses perception while Arthur uses inference. Again, if we see a man hurrying along the street, we may infer that he wants to speak to the lady in front of him. And we shall contrast this effort to learn his future action with our subsequent perception either of his speaking to her or of his not doing so. We say that seeing is believing, and by this we imply that there is a process alternative to seeing, which does *not* always produce belief.

2. The second point is that the contrast in question refers to the perceptible world, not to those parts or aspects of reality that are not the perceptible world. By 'the perceptible

world' I mean all that part of reality, our knowledge of which depends on perception or is perception. I use the word 'perception' here in its ordinary sense, in which it refers to a kind of knowledge that demands for its existence the presence of sensation. There are philosophical senses of the words 'perception' and 'sensation', according to which there would be such things as 'inner perception' and 'inner sense'. The bestknown occurrences of these senses are in Kant. But in the ordinary senses there are no such things as 'inner perception' and 'inner sense', and it is the ordinary sense of perception that I am using when I say that by 'the perceptible world' I mean all that part of reality, our knowledge of which depends on perception or is perception. The perceptible world is therefore the realm that includes snow and bread, houses and animals, lakes and the sky and the sun and many other things.

There is a remark that I must make about the perceptible world before I proceed. This world includes many things that, so far as we know, no one is in a position to perceive. For instance, the far side of the moon is a part of the perceptible world, although we believe that no one perceives it. A ruined city in the desert or in the forest would still remain a part of the perceptible world, even if all its inhabitants had deserted it. For the ruined city and the far side of the moon are connected with the things that are perceived in a way that we all understand and need not stop to analyse. What excludes a thing from the perceptible world is not the fact that owing to particular circumstances no one is perceiving it, but the fact that owing to its own nature and the nature of perception it is incapable of being perceived. The fact that two pairs of things make four things is incapable of being perceived, because of its nature and the nature of perception. But what prevents us from perceiving the back of the moon is a mere circumstance, which may one day be overcome. And therefore the back of the moon is a part of the perceptible world while the fact that two pairs of things make four things is not. None of the truths of mathematics belong to the perceptible world. Nor do metaphysical truths such as the truth that all being is being something.

3. In contrasting inference with perception in the way we do

we are referring only to particular facts; and not to universal facts, for they cannot be perceived. There are universal truths to be known about the perceptible world. But we are not concerned with them here because what is universal cannot be perceived.

Combining this point with the previous one, we may say that our contrast between inference and perception is a contrast that we find in our knowledge of the particular facts of the perceptible world, or in our efforts to know those particular facts.

4. What we mean by inference as opposed to perception is learning or trying to learn a particular fact of the perceptible world *without perceiving it.* And we assume that such learning must be indirect. We learn the fact in question, which we do not perceive, by apprehending that it is necessitated by something that we do perceive. For example, Arthur in the garden does not see that it is John who is playing the piano. But he learns this fact (if he does learn it) by apprehending that it is necessitated by the fact that the rendering (which he perceives through his ears) has peculiarities that belong only to John. His inference might go: 'The player is playing thus and so. Only John plays thus and so. Therefore the player is John.' The firstnamed premise is a fact that Arthur perceives. The second is a fact that he knows independently. The conclusion is a fact that he might have perceived but does not. And thus his inference is a case of learning or trying to learn a particular fact of the perceptible world without perceiving it, by means of apprehending it to be necessitated by something he does perceive.

5. In thinking of this contrast in the way we do we assume that perception is knowledge. We are unreflectively confident that Phyllis *knows* it is John who is playing the piano. A man *knows* whether he is in a house or not, whether he is clothed or naked, etc.

6. In thinking of this contrast in the way we do, we assume that perception is *direct* knowledge, and that the view that it is inference is false. This assumption is contrary to the opinion of many philosophers when they say that perception is an inference from sensation. In our ordinary thinking we do not agree with those philosophers. If we held perception to be

inference, we should not contrast the species perception with its genus inference, but, believing sensation to be the only direct knowledge in the matters we are here concerned with, we should contrast all inference including perception on the one hand with sensation on the other. As it is we commonly assume that perception is not an inference either from sensation or from anything else.

7. Furthermore, we assume that the inference we contrast with perception is not knowledge at all, but more or less probable opinion. For in every case we tend to disparage inference as opposed to perception by calling it 'mere inference' or an equivalent phrase. In every case we consider perception preferable to inference, and this is not because inference is more difficult than perception but because it is more fallible. Arthur in the garden does not *know* that it is John who is playing the piano. He only infers that it is, and he feels that his inference is an opinion, which though reasonable ought to be tested by sight. Therefore, whereas I formerly said that we meant by inference in this connexion 'learning or trying to learn' a certain kind of fact under certain conditions, I may now omit the first two words of that phrase, and say that inference in this connexion is always trying to learn and never actually learning, for it is never knowledge.

So much for our way of contrasting inference with perception in ordinary thought. I come now to my second endeavour, which is to give reasons for thinking that our knowledge of the perceptible world really is all direct knowledge and none of it indirect knowledge, and that any inference with regard to the perceptible world is a probable and not a certain inference. But I shall not start at the beginning of this question. I shall take the first and most interesting part of it for already decided. That is to say, I shall begin from the three following presuppositions.

1. Our unreflecting view about perception is right. Perception *is* knowledge, and it is *direct* knowledge.

2. Knowledge and opinion are what Cook Wilson says they are, as I have set out in an article in *Mind*, July, 1928. That is to say, knowledge is an activity of which we are all aware;

but we cannot define it, because it is of a peculiar and unanalysable nature. We can say that it belongs to the genus 'activity of consciousness'; but when we ask what specific activity of consciousness it is, we can only reply that it is that one which is knowledge. But though we cannot define knowledge, we know what it is. And the most important thing we know of it is, that when we reflect we see that knowledge is necessarily *certain*. It involves no possibility of error whatever. Another activity of consciousness is opinion, which in certain cases is called belief. Opinion is likewise indefinable, and its most important characteristics are (1) that it is not certain; and (2) that in opining we know that we are not knowing, *i.e.*, opinion involves the knowledge that it is not knowledge.

3. Science or natural philosophy is not knowledge. The statements our scientists make about the natural world are not known to be certain, either by us or by them. They are generalisations. The inductive method by which they are obtained does not give certainty. They are constantly being corrected, or rejected and replaced. Science is opinion. It is a system of careful observation and reasoning, and well worthy of our provisional belief. But the phrase 'scientific knowledge' is inaccurate. All that we really know in science is that the statements that our scientists make are well-grounded and highly probable.

In taking over these three positions without discussion I have put behind me the most interesting of all the questions about perception, the question whether it is direct or indirect knowledge. The question that remains to me is this. Assuming that perception is direct knowledge, is there any knowledge of the perceptible world that is not perception and not direct? Can we infer particular facts about the perceptible world with certainty, or are we right in our ordinary thinking when we assume that all inference about particular facts of the perceptible world is not certain but merely probable? The train of thought that I shall present in the rest of this article tends to shew that we *are* right, though it is by no means conclusive. I shall give it a dogmatic form in order to make it as clear as possible.

1. There is no certain inference from two premises, one of

which states a universal fact, while the other states a fact perceived. That is to say, we never make an inference of the form 'This *A* is *B*, All *B* is *C*, ∴ this *A* is *C*', when 'This *A* is *B*' is a singular fact that we perceive, and 'All *B* is *C*' is a universal fact that we know otherwise. The reason for this lies in the nature of our knowledge of the universal fact 'All *B* is *C*'. If we really know this fact (and if we *don't* know it of course there is no certain inference) we must know it directly. For it must be a fact concerning things that are capable of being perceived, *i.e.*, it must be a scientific or historical fact and not a mathematical or philosophical fact. The supposed inference must be of this kind: 'This cliff is stratified, All stratified cliffs were once under water, ∴ This cliff was once under water.' Here the major premise is concerned with things perceptible—water and cliffs—, and so it always must be if it is to have a term in common with the minor premise, which can lead to inference. But now how are such universal statements concerning perceptible facts, such scientific statements, knowable? How do we *know* that all stratified cliffs were once under water? We do not know it by induction, for induction gives only probability, not certainty. We do not know it by deduction, for it cannot be deduced. Science is hypothesis, not demonstration. If then we do know that all stratified cliffs were once under water (and I do not wish to deny that we do know it), we must know it directly. That is to say, it must be a self-evident proposition, because it is the very nature of a stratified cliff to have been formerly under water: if it had not been formerly under water it would not be a stratified cliff, although it might have parallel markings: 'having been under water' is included in the meaning of 'stratified'. But if we thus know directly that all stratified cliffs were once under water, then in the very act of perceiving that this cliff is stratified we apprehend also that it was once under water, and these are inseparable aspects of the same act. Our knowledge of the universal fact that all stratified cliffs were once under water is not the means of our knowing that this cliff was once under water: on the contrary it is itself known only in the particular instance. In our knowledge of this particular case we see the general truth. We do not learn the

particular case from the general truth. Thus there is no inference here. There is never a certain inference from two premises, one of which is a fact perceived and the other a universal fact. For the universal fact must be a 'scientific' fact, if it is to connect with a fact perceived. But science gives us no demonstrated truths. If it gives us any knowledge, that knowledge is direct. If the knowledge is direct it is seen directly in each particular case, and there is no need to infer the particular case from the general truth.

2. There is never a certain inference from two facts perceived. In geometry we get inference from two singular facts, such as '$A > B$ and $B > C$, $\therefore A > C$.' But here the premises are not known by perception, but rather 'by construction'. If we actually perceive that A is greater than B, and actually perceive that B is greater than C, then we actually perceive also that A is greater than C, and do not need to infer it. If we set three men in a row in order of height, we do not have to infer the relation of the first and third to each other from their relations to the second: we see it directly.

There are however some cases where there is a deceptive appearance of inference. Suppose I remember that John's hat is blue, and perceive that this cloth is blue, is it not an inference that John's hat is the same colour as this cloth? But what passes for inference here is really *comparison*. If I had not remembered that John's hat was blue at the same time as I perceived this cloth, I should not have become aware of the relation of this cloth to John's hat in point of colour. I may thus perhaps be said to have gained new knowledge. But I have not gained it by inference, for the new fact that I know is not something necessitated by the supposed premises—it is simply the two premises together. My advance consists in linking up two scattered items of information, not in finding that they necessitate something new. We have here an operation similar to the putting together of the premises in inference; but we have no conclusion drawn, and hence no inference.

3. There is no mediate certain inference where one of the premises is a fact perceived. This point is merely the sum of points 1 and 2. Point 1 was that there is no certain inference

from two premises, one of which states a fact perceived and the other a universal fact. Point 2 was that there is no certain inference from two facts perceived. These two alternatives exhaust the possibilities of mediate certain inference where one of the premises is a fact perceived, and hence there is no such thing.

4. Immediate inference, as described in formal logic, is not inference at all. It is said that in immediate inference, given one relation between two objects, we infer directly another relation between those objects. For example from All A is B we infer directly that Some B is A. And it might be said—though this is not a case recognised in formal logic—that from X is father of Y we infer directly that Y is child of X. Now in these cases it is true that the fact that All A is B is distinct from the fact that Some B is A, and that the fact that X is father of Y is distinct from the fact that Y is child of X. These statements have distinct meanings. But that does not prove the presence of inference here. It is true that of the distinct facts here one necessitates the other. But that again does not prove the presence of inference. There would only be inference if we could learn one fact apart from the other, and then go on to see that the other was necessitated by the one. But this we cannot do. Although we may *say* no more than that All A is B, if we ***know*** anything at all we necessarily know, in one and the same apprehension, both that All A is B and that Some B is A. The statement 'All A is B' only represents one aspect in a whole that we know as a whole if we know it at all. When we go on to say 'Some B is A' we are not reaching new knowledge, but only amplifying our statement of the knowledge we have had all along. Hence the immediate inference of formal logic is not inference at all, because it is not gaining new knowledge by seeing it to be necessitated by something known before.

5. There is no immediate certain inference from a fact perceived. The argument for this is as follows.

We have seen that immediate inference in the sense of those words in formal logic is not inference at all. We therefore need not look for any inference of this kind from a fact perceived. But it seems as if there are immediate inferences of another and

more important kind, in connexion with perception. For example, if I see the near side of a ball rotating, do I not infer with certainty that the far side is rotating? And if I find a new book, do I not infer with certainty that the book was written by a man? In both of these examples I agree that we have knowledge. I agree also that there is something in this knowledge that makes it tempting to call it inference. But I deny that this knowledge is inference, if that means that it is learning a fact through seeing it to be necessitated by another fact.

By perception I understand knowledge that we have on the occasion of sense-stimulation. The important thing is to decide what exactly this knowledge is in any particular case. Now I say that in the case of the ball this knowledge is that the ball is rotating, and nothing less than that. The view, according to which we have inference here, must maintain that what I directly know is not that the ball is rotating, but merely that the near side of the ball is rotating. Now this is an impossible thing. We cannot know that the near side of a ball is rotating, except when we know it as an aspect in the whole fact that the ball is rotating. If we know there is a ball in front of us, then either we know that the whole ball is rotating or not rotating, or else we neither know whether the whole ball is rotating nor whether any part of it is rotating. There cannot be an inference here, because both the supposed premise and the supposed conclusion are facts we only know in directly knowing the whole fact that the ball is rotating.

The same argument applies to the book. If I really know that the object before me is a book, I do not need to go on to infer that it was written by a man; for a book is by nature written by a man—a book that was not written by a man would not be a book at all—and therefore I know that it was written by a man in the very act of knowing that it is a book. There is no inference, for the knowledge is direct. It is true that the fact that this is a book necessitates that it was written by a man. (Similarly the fact that the near side of the ball is rotating necessitates that the whole ball is rotating.) But the fact necessitated is not learnt by me just as necessitated. On the contrary, both the fact necessitated and the fact necessitating

are learnt together by me in one single act of direct knowing. If I do not know that this book was written by a man, then I do not know that this is a book at all, but only that it is a physical object made of paper curiously marked. If I do not know that the whole ball is rotating, then I do not know that the near side is rotating: I only know that I perceive a something, I know not what.

I have dealt with the two cases I produced, by admitting them to be certain but denying them to be inference. With all other cases that might be produced I should deal either in this way or else by denying them to be certain. For instance, if it were urged that from 'This is a physical object made of paper curiously marked' there might be an inference to 'This is a book', I should reply that this is not certain; and that we can never be sure that this is a book unless we know *directly* that it is. If it were said that it is a certain inference from perception that there will be a total eclipse of the sun on such and such a date, I should urge that this is not certain, because (1) the possibility of unforeseen perturbations in the heavenly movements cannot be eliminated and (2) the laws of nature are not known, but only guessed at.

The case of what would be called inference from a man's word deserves special notice. A man may say to me that he has just come from London, and I may know that he is speaking the truth, and thereby—and thereby only—know that he has just come from London. Now my knowledge that he is speaking the truth (which I am willing and even anxious to admit) is direct knowledge. There are no conclusive grounds for inferring it, so that if I do not know it directly I do not know it at all. This is just one case of our knowledge of other persons in general. If we do not know *directly* that other people exist and something about them, then we do not know it at all, for we certainly cannot rigorously deduce it from anything else. Similarly if I really know that my friend is in pain, I know it directly. For his actions constitute no infallible guide to the state of his mind. They can only be the *occasion*, on which either direct knowledge of this state of mind supervenes, or else I fail to know his state and am reduced to a mere opinion about it. In this way then my knowledge that the man is speaking the truth when he says

he has just come from London is direct. But is my knowledge that he has just come from London an inference from it? Not so. It is clearly included in my direct knowledge that he is speaking the truth when he says he has just come from London. I know the two things together if I know either of them at all. Either I know directly that he has just come from London; or I do not know it at all, but only opine it.

'But we actually *see* the near side of the rotating ball, and we do not see the far side.' These words, whether they are sufficiently cautiously expressed or not, indicate a fact we have no difficulty in recognising. The question is whether this fact disproves my present argument or not. I say that it does not, for what these words are trying to state is the fact of sensation, the fact of the influence of the object on my sense. It is only the near side of the ball that affects my sense: the far side does not. But now the affection of sense is not perception, for perception is knowledge. The affection of sense is only the *occasion* on which the knowledge that is perception arises. Knowledge always requires an occasion, which must consist either in sensation or in imagery. But the knowledge that arises upon the occasion is direct knowledge. And in the present case, although it is only the near side of the ball that affects my sense, the knowledge I have upon the occasion of this affection is knowledge of the whole ball. Similarly in the case of the book, the sensation that occasions my knowledge here is a sensation caused by the book alone, and not by the author: nevertheless the knowledge that arises upon this sensation includes knowledge that there is an author. This is the fact that makes it plausible to suppose that we have inference here. We are related to the near side of the ball in a way in which we are not related to the far side—by sensation. By a confusion we assume that all we directly know is what affects our sense. From this it follows, since we certainly know the far side, that we know it indirectly. The mistake lies in assuming that all we directly know is what affects our sense. The affection of sense is only the occasion of knowledge, and the knowledge it occasions is never the bare knowledge of that which affects our sense.

6. There is no certain inference at all from a fact or facts

perceived. This is the combination of point 3, that there is no mediate certain inference from facts perceived, with point 5, that there is no immediate certain inference from facts perceived. With regard to the perceptible world we either know directly or we do not know at all.

7. Inference as opposed to perception is merely *opinion* about the perceptible world. It follows from point 6 that all inference from facts perceived is merely probable. Now probable inference is the same thing as grounded opinion. Probable inference is opining that A is B because you opine that certain known facts necessitate A's being B. It is guessing at a necessitation instead of apprehending it.

Such are the considerations that appear to me to suggest that we are right when, in our ordinary thinking, we assume that all inference about particular facts of the perceptible world is not certain but only probable.

I am inclined to think that similar considerations would apply to two other contrasts: (1) the contrast between a man's direct knowledge of his own states of mind and my indirect knowledge or opinion about those states, (2) the contrast between a man's direct memory [1] of his own past life and my indirect knowledge or opinion about it. I am inclined to think that in these two cases also indirect knowledge never occurs, and that we always have either direct knowledge or no knowledge. The first case was touched on above on page 255. But it is a separate enquiry, and so is the second.

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[1] The view that memory is direct has perhaps about the same degree of probability as the view that perception is direct.

REVIEWS OF BOOKS

Greek Philosophy before Plato. By ROBERT SCOON. Princeton, Princeton University Press, 1928.—pp. viii, 353.

The work of Burnet in this field is so judicious, so penetrating, and so inclusive, that, on seeing a new "Greek Philosophy" issuing from an academic press, one's first question is, inevitably, What can possibly justify this publication? How can these three hundred and fifty-three pages be anything more than needless repetitions of work already done?

To this question the author gives no direct reply. His preface merely refers to the approval of teachers and relatives, encouraging his expansion of a (doubtless excellent) doctoral dissertation. But an examination of the body of the work enables the critic to select and emphasize certain points which perhaps justify the encouragement which the author has received. An important possible standpoint is (comparatively) neglected by Burnet, a standpoint designated as "historical". If history is to be regarded as fundamentally continuous, the historian's task may consist largely in establishing the links and influences which underlie the different systems. The result of applying this method strictly is to change the whole appearance of what is traditionally presented as "Greek Philosophy". The individuality and sharp outlines of Burnet's portraits disappear, and their place is taken by a kaleidoscopic texture of motifs which are only partially philosophical, and have an evolution only partially affected by the attempts of a Heraclitus or a Parmenides at carrying through a definitive synthesis of these motifs.

Given a disposition towards synthesis, at projecting an imaginary world-picture on the basis of organized human experience, what are some of the chief motifs? First and foremost, we have the animistic projection which gives us anthropomorphic religion, the poetical creation of a Homer or a Hesiod, peopling the world with capricious, all-too-human divinities. Another motif is the social institution of law, which—when universalized in turn as an element in the synthesizing projection—proves inconsistent with divine caprice. The economic motif of intelligence as the only tolerable directive force, the rhetorician's technique of persuasion by means of interimplicative propositions divorced from correspondence with empirical facts, the

musician's technique of harmony, the mathematician's technique—all these furnish motifs which, according as one or the other dominates in the synthetic tissue, give rise to religion, politics, industry, art, science, or philosophy. All of these motifs are human and pragmatic, and all are so interwoven that to neglect any one or two of them is to fail to understand religion, or science, or philosophy. Philosophy has, in fact, no autonomous continuity, and its 'history' represents a succession of syntheses whose continuity is with the general texture of motifs, and cannot be explained by reference to logical considerations alone.

Let us consider how that new thing, 'philosophy', originated. Greek social experience had developed the institution of law as a way of readjusting the social balance after a period of disorder. The extension of this concept to natural phenomena gave rise to science, and the resulting synthesis substituted this new field of law, *i.e.*, the world studied by science, as an object of serious respect, in place of the capricious fictions of poetical theologians. Emotional contemplation of starry orbits became substituted for the exciting dances of the popular Mysteries, as a means of soul-purification, and the new 'philosophy' was thus the substitution of a quasi-scientific for a merely poetical *Weltanschauung*, as a source of vital experiences.

Against this background, the well-known figures of Greek philosophy assume unusual shapes. Parmenides as the incarnation of the rhetorician's technique, Pythagoras as a primitive cosmologist whose "one", identified with "the original mass of fire", is split up by successive inhalations of air or void, Empedocles as identifying his "sphere" with both Love and Cosmic Mind, Atomism as a primarily logical reaction to Eleaticism—these, and many other pictures drawn by our author, are novel, and would have seemed novel even to Aristotle. On the other hand, the Sophistic movement is treated in a way which would be considered, in spite of the neatness of the author's phrasings, conventional, and the significance of Socrates receives a coloring admittedly Burnettian.

Like many writers on Greek philosophy, our author contends that we should read as few as possible of our modern *-isms* into the early writers, and should put ourselves into the position (say) of Plato. But (also like most other writers) our author finds himself, in practice, using words like 'idealism', 'humanism', 'pluralistic materialism', etc. etc., much the same as the rest of us. And as to "the position of Plato", if the author would kindly make definite just what he understands by this, we might be in a position to judge the value of his suggestion that we adopt some such position.

One flat inconsistency springs out from the smooth phrasing. "Thought" (for Empedocles), "the meeting of likes" (p. 92), is identified with Love which elsewhere "mixes *un*likes" (p. 87). That which mixes likes, and that which mixes unlikes, cannot possibly be identified, and with this impossibility falls the central prop of one of our author's most ingenious interpretations. There is also (as with most writers in this field) a little *ex cathedra* dogmatising. The author is not at his best when declaring that "in his opinion" the fragments attributed to Philolaus are "undoubtedly genuine". The reader will find them, as translated in an appendix, providing, on the face of them, proof after proof of Erich Frank's contention—ignored by our author—that they are late (academic) theorisings published under a literary pseudonym in accordance with the prevailing literary fashion.

The original elements in the new *Greek Philosophy before Plato* have been sufficiently indicated. There is undoubted plausibility in the position assumed by our author. It is, however, a position which, if it is to be convincing, requires greater thoroughness, greater vigor, and greater erudition, than our author appears to have at his command. As written, much of his book has the value which is usually attributed to the essay-form of composition: it is interesting, suggestive, frequently plausible. But in the present age of scholarly thoroughness, much of the book will be thought inadequate. It will be conceded without question that every page makes pleasant reading. But, when compared with the work of Burnet—it is unfortunate for our author that this comparison is inevitable—, it must be admitted without reserve that the new book is not so judicious, not so penetrating, and not so inclusive.

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Plotin. Enneades. IV. Texte et traduction par É BRÉHIER. Paris, Société d'Édition "Les Belles Lettres", 1927 —pp. 470.

The Association Guillaume Budé have undertaken a work that cannot be too highly praised in seeking to render the classics easily accessible to the French reader. A somewhat similar service, to be sure, is being done in English by the Loeb Classics; but their translations, generally speaking, lack the fearlessness and honesty of the French, and are marred by the equivocations and relapses into the original unhappily demanded by the Anglo-Saxon when Greek and Roman standards of taste and morals do not accord with his own. This unflinching veracity and straightforwardness of the Latin mind gives an extra assurance to the reader, even where he has not to be on

the look-out for prudery, that the version he has before him is as complete and accurate as the skill and scholarship of the translator can make it. Moreover, the Budé series has gone further afield, particularly in the realms of philosophy, than the Loeb. To this fact M. Bréhier's translation of Plotinus bears witness, the fourth volume and Ennead of which appeared in 1927. We have, to be sure, in English the masterly rendering, now nearly completed, of Mr. Stephen McKenna, but in M. Bréhier's volumes we have the only parallel presentation of both text and translation existing in any modern language. Their usefulness is, then, by no means confined to the French reader. They are a boon to all students of philosophy who can read French, and particularly to those interested in Neo-Platonism.

But M. Bréhier is not only helping to round out the Association Budé's presentation of the life and thought of classical antiquity. He is contributing to our knowledge of a philosopher who deserves to be more read and better known. In the nineteen centuries that intervened between Aristotle and Descartes Plotinus was easily the most comprehensive, profound, and original philosophic mind that appeared upon the scene. And he is one of the great mystics of all time. Not only that, but he is a philosopher who may yet prove to be peculiarly congenial to our age. It is interesting to speculate whether the days in which we live have not much in common with the last days of Paganism, when the old sanctions and faiths were dying and men were seeking and finding in philosophies the consolations they could no longer find in religion. Lucretius taking refuge in the high indifference of the atoms storming through the void according to eternal law, the Stoics with their vague and optimistic pantheism and their ethics of resignation to a world where all is really for the best, and even the relief accorded by the agnosticism of the Sceptics tempered by the doctrine of probability, have their modern counterparts. And we are perhaps witnessing the beginnings of a revolt against science and a despair of reason that, if it is carried to any length, must reinstate mysticism as the only access to Reality left to us. At present the forms of mysticism with which we are familiar are either Oriental and alien in many ways to Western needs and modes of thought, or else bound up with religious imagery and concepts that, it may be, we are discarding. But in the Plotinian system we have a philosophic presentation that is untrammeled by any theology, that continues the work of the senses and of reason instead of negating it, and that preserves and supplements, where Oriental mysticism destroys, the reality of the every-day world of

men and affairs. These are also the lines along which we may reasonably expect any mystical development of our modern Western thought to proceed; in which case Plotinus may prove not only one of the great minds of the past, but a guide, philosopher, and friend, of the future.

The auspices under which M. Bréhier's work appears, as well as his own position and reputation, are sufficient guarantee of the soundness of his edition and translation of the text. Plotinus' Greek is notoriously obscure. Indeed his pupil Porphyry intimated that he could not complete a sentence. But thanks to the combined genius of the translator and of the French language, the difficulties of the original are minimized, and the greatest possible clearness compatible with fidelity to the text is achieved.

The volumes, like all the Budé series, are solidly put together, beautifully printed on first class paper, and—another boon both to the public and the scholar—so inexpensive in price as to be within everybody's reach.

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Chinesische Philosophie. By HEINRICH HACKMANN. München, 1927, —pp. 408.

Dr. Hackmann's *Chinese Philosophy* is the fifth volume of the *History of Philosophy*, a collective work edited by Professor G. Kafka of Dresden. This volume is intended to be a complete history of Chinese philosophy, covering its development from the earliest antiquity to recent times. As such it is sure to prove most helpful to Western students, and indispensable to general readers who desire a clear and connected knowledge of Chinese philosophical development; for practically no other work on this subject has ventured beyond the ancient period, and those few books that specially deal with the later periods frequently fail to satisfy the serious student and possess little attraction for the general reader. There are two chief reasons why very few Western scholars have attempted to write a complete history of Chinese philosophy. Firstly, it is commonly believed in the West that the development of Chinese philosophy ended with the period of Confucius, Lao tse, Chuang tse, and Mencius, and that during the subsequent two thousand odd years no original contribution to the subject has been made. Consequently it is considered justifiable to ignore the later periods. Secondly, it is a fact that the earlier Chinese thinkers are better known to Western students than those of later times. A large number of important

ancient philosophical works have either been translated into Western languages—the works of J. Legge being, of course, the most notable—or introduced to the West through expositions and commentaries. But when we turn to the period since the third century before Christ, we find rather scanty materials accessible to Western readers for the study of even the most eminent thinkers, such as the Sung Confucians, Chu Hsi and Lu Chiu-yuen. A Western scholar who tries to write a complete history of Chinese philosophy is therefore confronted with the difficulty of securing adequate material for the latter part of his book. It is a pleasure to be able to say that Dr. Hackmann has succeeded in overcoming this difficulty. Many years of patient effort have given him an admirable knowledge of Chinese thinkers of all times. His book is excellent throughout; but the portion that deals with Chinese Buddhism is of special value. It gives the reader a coherent knowledge of the introduction, development, and decadence, of the several buddhistic schools, a task that requires considerable ability, especially when done in a space of less than seventy-five pages. Another useful portion of this book is the section dealing with Confucianism of the Sung and Ming periods (pp. 312–371). There we find, among other things, a brief but lucid account of the life and ideas of Chu Hsi, the greatest Sung philosopher, and of Wang Shou-jen, the most eminent of Ming philosophers.

The central merit of Dr. Hackmann's book, however, lies in his success in seeing and treating the three thousand years of Chinese philosophy as a course of progressive development, moving and changing its content as the *Zeitgeist* of the various periods moved and changed. In this way he dispels the mistaken idea that the philosophical genius of China was exhausted in the so-called Ante-Ching period, and that the study of Chinese philosophy is a matter more of antiquarian or ethnological than of genuine philosophical interest. In order better to exhibit the stages of development, and for the sake of convenience in treatment, Dr. Hackmann divides the history of Chinese philosophy into four distinct periods and allots a well-proportioned space to each. The first is the period of original invention and free development, in which we encounter such names as Lao tse, Confucius, Me Ti, Yang Chu, and Chuang tse. To this almost one half of the book is devoted. The next period extends from the time of the "Warring States" (fourth century B.C.) to the time of the philosopher Wang Tsung (West Han, first century A.D.), and is characterized as a period of philosophical stagnation and torpidity. A space of less than seventy-five pages is assigned to this.

The third period, "Buddhism as Chinese Philosophy", brings us down to the ninth century A.D. The fourth period covers the Sung, Ming, and Tsing philosophers and occupies a space of less than seventy pages. Thus, according to Dr. Hackmann's interesting and essentially correct interpretation, the march of the history of Chinese philosophy consists of four main movements: first, creative philosophical genius had its free play and produced the "Golden Age" of the Ante-Ching period; second, the philosophical spirit sank into a state of lethargy, and scholars devoted their full time and energy to the understanding and interpretation of ancient texts; third, the introduction of Buddhism brought fresh impetus to the Chinese philosophical mind, and not merely produced a number of buddhistic schools which are peculiar to China but prepared the way for the renaissance of the ancient schools in the subsequent period; fourth, incited and influenced by foreign thought, a number of Sung thinkers, including the Cheng brothers, revived and further developed the Confucian doctrines to a comparatively high degree of perfection. This movement culminated in the teachings of Chu Hsi, who is frequently regarded as the greatest systematizer and synthetist of Chinese philosophy. But the rigid and over-refined character of Chu's school soon met with opposition in Lu Hsiang-san and his followers in the Sung Dynasty; this opposition grew to its highest point when the Ming philosopher, Wang Shou-jen (more often known as Wang Yang-ming), advanced his famous doctrine of the "unity of knowledge and action", and his idealistic monism. Of what happened after this Dr. Hackmann has very little to say. Perhaps the time has not yet arrived for writing the history of Chinese philosophy during and after the Tsing Dynasty. At that period philosophical ideas began to be freely introduced from the West. And they are bound to influence Chinese thought and move it in the direction of a great philosophical synthesis, greater perhaps even than that started by the introduction of Buddhism.

There are points in Dr. Hackmann's book about which a reader may reasonably differ in opinion. One might think that Dr. Hackmann has over-stressed the peculiarities of the Chinese language as an explanation of the slow development of Chinese philosophy (pp. 13–20). He points out that Chinese words often have an unfortunate plurality of meanings. But ambiguity is a common defect of all languages, even though the Chinese may suffer from it in an unusually great degree. Words like "*Welt*", "*Idee*", "*Geist*", are certainly not much better than "*shin*" (heart, mind) or "*tien*" (heaven,

Nature, God). One might also object to Dr. Hackmann's statement that the Chinese thinkers possessed no metaphysics and that their philosophies fall short of a system (p. 11). If we read Dr. Hackmann's own book through carefully, we can see for ourselves that Lao tse, Chou Teng-i, and even Yang Chu, had a metaphysic, and that the great Sung and Ming philosophers were not without well-defined systems. If it is suggested that the Sung and Ming systems were the results of foreign influence and not products of purely native genius, we may retort that practically all the great systematic philosophers in the West were influenced by foreign currents of thought. What would Kant have been without the influence of English empiricism!

There are a few minor defects in Dr. Hackmann's book. For example, on page 318 we read that the *Tung Shu* of Chou Teng-i "*zerfällt in zwanzig Kapitel*", whereas this work contains forty chapters. On page 354 the Germanized name of the renowned thinker Lu Chiu-yuen is misspelled Tchi*n*-yuen. Lu's correct dates are 1139–1192 A.D., namely, the Ninth Year of Shao-shing to the Third Year of Shao-shih; Dr. Hackmann wrongly gives the date of his birth as 1140. Lu was born in Ching-chih, a city in the present province of Kiangsi; Dr. Hackmann wrongly regards him as a native of the province of Fukien. Such defects, though of no great importance, mar the general excellence of the book.

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Kant und die Als-Ob-Philosophie. By Erich Adickes. Stuttgart, Fr. Frommanns Verlag (H. Kurtz), 1927.—pp. viii, 292.

Die Zeit- und Raumlehre Kants (Transzendentale Aesthetik) in Anwendung auf Mathematik und Naturwissenschaft. By Ernst Marcus. München, Ernst Reinhardt, 1927.—pp. viii, 239.

Le Jugement Réfléchissant dans la Philosophie Critique de Kant. By Michel Souriau. Paris, Félix Alcan, 1926.—pp. xi, 143.

Der Begriff der Ganzheit und die kantische Philosophie: Ideen zu einer regionalen Logik und Kategorienlehre. By Hans Heyse. München, Ernst Reinhardt, 1927.—pp. xvi, 192.

Professor Adickes intends his book to exhibit the contrast between historical objective interpretation and partisan exploitation. It is a severe and extended criticism of Professor Vaihinger's treatment of Kant's philosophy, which, it is here maintained, is dominated by the excessive zeal to claim Kant as a patron-saint of the "As If" philosophy. This book is the outcome of previous controversy between Vaihinger and Adickes, and is intended by the latter as a conclusive summing-up.

That Kant regarded things-in-themselves, God, soul, freedom of the will, immortality, not as realities but as fictions, is an assertion which, according to Professor Adickes, only a distortion of Kant's text can even remotely substantiate. That the exploitation of Kant in the interests of fictionalism has in fact involved serious distortion, is a major charge of the volume, supported by a great number of direct quotations. While Adickes' critique is ruthless, he repeatedly insists on his personal high regard for his opponent and would nowise permit his charge of text-corruption to be construed as an accusation of dishonesty. The facts, as marshalled here, are meant to point out how far a scholar of the highest standing and of undoubted personal integrity may go in distorting text and meaning of a great philosopher, when carried away by polemical zeal. Vaihinger, we are to judge, gives misleading reports of Kant's meaning; he neglects or quite ignores passages that run counter to his interpretation, and accentuates unduly those that seem to him to admit of a fictionalist reading; or worse, he secures this seeming fictionalism by unwarranted paraphrase, by incomplete quotation, and even by bold omission and replacement by dots of the very clauses or phrases in the Kantian text which would preclude the intepretation that Vaihinger fastens upon the quoted remainder. Of these varieties of dubious procedure Adickes cites instances all through his book, and some of them appear truly amazing. The present reviewer should state that he has not checked Professor Adickes' quotations from Professor Vaihinger's works, and is here merely reporting the contents of the volume before us.

By 'fiction' Vaihinger understands "a scientific invention for practical ends" or "an expedient imaginative creation designed to facilitate scientific thought" (p. 15). Fiction is thus to be distinguished from a hypothesis, which claims a correspondence to and verification by the facts. Because we designate fictions by expressions like "as if", it does not follow that Kant's use of this and similar expressions stamps him without further comment as a fictionalist.

Turning now to his task in detail, Adickes examines in successive sections of his book the thing-in-itself in Kant, the doctrine of the Ideas in the *Critique of Pure Reason*, and the postulates of practical reason in the *Grundlegung* and in the *Critique of Practical Reason*. A separate section devoted to Kant's writings after 1790 closes the book.

Regarding Kant's treatment of the thing-in-itself, Vaihinger's views are changing and inconsistent. As a strict historian of philos-

ophy, in his *Kommentar* to Kant, Vaihinger nowhere upholds a fictionalist interpretation, but in his systematic exploitation of Kant the procedure and the conclusions are decidedly altered. Is Kant, or is Vaihinger, such an "antithetical" mind as to maintain side by side such radically opposite views? That Kant's doctrine of the thing-in-itself involves contradictions, is certainly undeniable, but it is a historian's duty not to accentuate them artificially. Even in Kant's *Opus posthumum*, from which Vaihinger expects so much in support of fictionalism, while Kant's different tendencies and directions of thought involve definite shifts in emphasis, conditioned by the effort to meet the demands of his epistemology, or of his metaphysics, or of his moral and religious philosophy, it is not the reality of the thing-in-itself but our knowledge of it that is at stake.

With regard to the doctrine of Ideas in the *Critique of Pure Reason*, Adickes contests Vaihinger's position step by step, confronting his quotations with Kant's full text. According to Adickes, there is not a single passage in the *Critique of Pure Reason* which justifies the interpretation of Kant's Ideas of Reason as fictions in Vaihinger's sense of the term. By designating them as "heuristic fictions" Kant means simply to indicate his use of them as regulative principles; when he calls them "mere Ideas", it is from the point of view of the strict transcendental philosophy which can nowise pronounce upon the objective transcendent reality of its concepts; and the passages in which the expression "as if" occurs, if studied in their contexts, not only do not demand a fictionalist interpretation, but rather serve to preclude it. There is no duplicity in Kant, affirmation of the reality of these Ideas on one side and treatment of them as mere fictions on the other. On ethical grounds Kant is as firmly convinced of the reality of God, freedom, and immortality, as he is clear in his mind that these Ideas are beyond the reach of theoretical demonstration. So it is the strict transcendental philosopher who, severely censuring the dogmatic presumption of rationalism, declares that these are "mere Ideas", that is, theoretically undemonstrable, but by no means explicitly unrealities, or "fictions" in Vaihinger's sense.

This general conclusion Adickes reinforces by examining the *Grundlegung* and the *Critique of Practical Reason*. So, for instance: it may be theoretically impossible to show how man can be free, but each act of the rational moral will is a clear instance of freedom (p. 150). When we are asked to choose the maxims of freedom *as if* they were to hold as laws of nature, the validity of the categorical imperative is nowise in question, only its naturalistically fictional

character is exhibited: good reason for caution in claiming naturalistic theoretical validity and status for the moral law and its domain, but no reason at all for treating morality and freedom as unreal and self-contradictory fictions.

Kant's later works, published after 1790, do not justify a different interpretation; they provide no evidence of Kant's departure from his lifelong resolute theism; they rather support his consistent position: disclaiming theoretical assurance of convictions that rest on moral grounds.

While only Adickes' general treatment and conclusions have been indicated here, it should be kept in mind that this volume is not merely a general disclaimer of Vaihinger's contentions, but a very minute analysis of Kant's works. In view of the too common temptation to strain genealogy in the search of exalted ancestry, this work, solidly and amply documented, vigorous and self-restrained, should prove a wholesome warning not to confuse the historical interpretation of a great system of thought with its critical exploitation in the interests of further system-building. Straightforward adherence to this principle will serve to make ever clearer the actual positions attained by our predecessors in philosophy, and will thus serve more adequately to point the path or paths to further profitable advance.

Ernst Marcus is the author of a series of works dealing with the Kantian philosophy and its application to present scientific-philosophical problems. In his *Zeit- und Raumlehre Kants in Anwendung auf Mathematik und Naturwissenschaft* he undertakes to defend a cosmology resting on unreservedly Kantian foundations. He claims as the basis of his work the validity of Kant's thought in its entirety; his watchword is: Not merely ten per cent, but all of Kant or nothing! In this unswervingly loyal application of what he regards as Kant's doctrine, Marcus regards himself as a pioneer, which would be fortunate if true.

Against the pretensions of natural-scientific empiricism claiming ultimate philosophical validity and leading to ethical scepticism, this work upholds the Kantian apriorism with regard to space-time and their laws as prerequisite to the explanation of our empirical knowledge of the space-time world. The Critical philosophy discloses pure sensibility and its *organa*, space and time, as the territory of the knowable world, with cosmic, universal actuality. But transcending sensibility and space-time, though not transcending consciousness, is the thing-in-itself, beyond knowledge but not beyond reason.

From the general point of view of this position Marcus reviews

geometry, examines in some detail the essence of the Dialectic, and devotes himself to scientific application and to cosmology. An interesting example of the latter is his discussion of the possibility of a general theory of the ether, to which the latter part of his book is devoted. Criticizing the several alternative theories, he champions one designated by him as the Kantian: There is in the world only one sort of matter, namely ether, and all bodies are only specific states (*modi*) of ether. Only by this theory do we avoid the dualism of bodies and ether, and have to do only with ether-states and ether-changes. The difficulty confronting this theory is: how to explain the perceptible nature of the secondary ether (bodies), while the primary ether escapes our ken. We seem to perceive only ether-islands in the ether-sea. A solution is sought by treating the secondary perceptible ether as the organized ether, and the primary as the unorganized. Whether this reduction of the very elaborate and various corporeality to ether-organization or to vital-ether involves more than a mere trading in terms, appears questionable. The author suggests further elaborations of the doctrine of space and time from the point of view of this general theory of the ether, and at the end of his book registers a firm reaction against materialism.

Dr. Souriau's careful and interesting work, *Le Jugement réfléchissant dans la Philosophie critique de Kant*, leads to the conclusion that the *Critique of Judgment* represents, not only an architectonic completion of Kant's system, but also a clearer expression of its fundamental features and motives. The development of the Critical philosophy, it is here maintained, records an ever lessening emphasis on the understanding and a corresponding accentuation of the primacy of practical reason, a gradual ascendency of reflective judgment over determinant judgment. In tracing the development in this direction of Kant's thought, Dr. Souriau studies the sources of Kant's teleology and the importance it assumes in Kant's mind as he turns to the problem of æsthetics. Kant's "Critique of Taste", to which he refers in a letter to Reinhold in 1787, matures into a *Critique of Judgment* as Kant overcomes the incompatibility of speculation and æsthetics, as he comes to see in creative activity æsthetic as well as teleological character, a synthesis of theory and practice: and then Kant's entire philosophical enterprise gains in meaning and in organic unity. Æsthetics is thus made possible *a priori*, resting not on a visible Absolute but on the reach after the Absolute, not on the passive contemplation but on the active creation of beauty. So between the "nature" known to the understanding in science and the exalted

realm of moral ends, the purposiveness and creativeness of the reflective judgment provide mediation and a ground of synthesis.

The idea of the Whole, of Totality, as dominant concept and ultimate category has been attracting consistent attention in recent philosophy. Dr. Heyse's work, *Der Begriff der Ganzheit und die kantische Philosophie*, undertakes to find in this idea the center of Kant's thought, and to interpret Post-Kantian idealistic philosophies as speculative developments of this central Kantian notion.

To this end Dr. Heyse examines the logic of the *Systembegriff*, or the concept of the whole. It expresses the ultimate essence of Kant's pure reason: the heart of the transcendental philosophy is in the forms of a *regional logic*, a logic of orientation and synthetic organization of relative totalities into a universe. The objectivity of the pure forms of intuition, space and time, of the categories, of the Ideas, all find their crux and center in this notion of the "ganzheitlich fundierte, regional gegliederte Gegenständlichkeit" (p. 42). The idea of the thing-in-itself is the concept of the wholeness and totality of reality; the phenomenal world, on the other hand, is for Kant the relative totality spatially-temporally coördinated and ordered in accordance with the categories. So the Kantian philosophy is expounded as a regional survey and interpretation of the world: perceptual and physical-phenomenal on the one side, noumenal on the other, teleological, moral, metaphysical. We may give two instances of this interpretation. Kant's freedom, according to Dr. Heyse, is neither psychological nor normative, but rather regional; the idea of freedom is the attempt to express adequately the essence of human character as in and of nature and yet as autonomous. The idea of God, similarly, is "the form of the regionally all-comprehending, maximally enhanced reality, which guarantees the realization of the moral ideal" (p. 133).

The recognition of the ideas of "regionality" and "totality" as focal in Kant's philosophy serves to indicate Kant's relation to his great predecessors (Plato, Aristotle, Plotinus, St. Thomas). It should also guide us in perceiving the right path of further advance. The tendency to identify a rational with a physical-scientific view of the world indicates an inability to perceive that the categories of mathematics and physical science form only a specific "regional" form of the rational view of the Whole, and not by any means the only or the most significant form of rationality. So Kant's philosophy imposes on us the task of more complete regional orientation and architectonic construction.

Adapting the words of Matthew Arnold, to see life steadily is to see it whole. In emphasizing this aspect of Kant's thought Dr. Heyse shows unusual vigor and penetration, and keenness in the use of his texts. If one should object to his method and conclusions, that they involve a deliberate reinterpretation rather than a strict exposition of Kant's philosophy, he might well answer with the words of Fichte, that he has been concerned less with what Immanuel Kant says and more with what the Holy Ghost says through Kant. Certainly his work is a very stimulating piece of interpretation and is itself a program of philosophical synthesis deserving of respect and support.

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Forms of Individuality. By E. JORDAN. Indianapolis, Progress Publishing Co., 1927.—pp. ix, 469.

"While such conditions", says Mr. Jordan in concluding his preface, "as I have tried to describe prevail in the public life of mankind, the issue of a theoretical or speculative discursus will remain perhaps of little importance; as a consequence, and in the meantime, if any one cares to entertain himself with throwing a stone into the stagnant complacency of contemporary human interest, it matters little whether he cast a pebble or a pearl." What a nutritious bit for the underground psychology popular just now! To make much of it, however, would be to take advantage of Mr. Jordan at a low ebb of self-confidence. A preface is not the place to measure the chest expansion of an author; it is almost always abnormal there, one way or the other. But aside from any question of complexes and compensations, the figure of speech presents an issue which a reviewer with a sense of responsibility may not avoid. He must try to decide, though the author may refuse to do so, whether what is cast *is* a pebble or a pearl, and he must, if he can, give some reason for his judgment.

Well, as a piece of writing the book is not, in my judgment, a pearl. Mr. Jordan has been at insufficient pains to make himself understood. The years of reading and meditation which he has put into the work —it is the result of nearly a lifetime's devotion—have involved him in a universe of discourse peculiar to himself. He has come to be naturally at home with what must appear to the uninitiated as very odd conceptions of familiar objects, a cryptic manner of expression, and a weird outlook on the everyday world. For this fact he makes not the slightest allowance; writes indeed as if the reader had kept the vigils with him. I do not know what to make of it, academic innocence or something worse, but it is deplorable. Some philoso-

phers, writing of matters certainly no less profound, have punished themselves to make their meaning clear. Mr. Jordan leaves the punishment to the reader and the clarity to chance. We greatly need in contemporary life the influence of the liberal spirit one catches fleeting glimpses of in the book. But if this spirit is to be effective it must be liberal enough to conceive of writing as something more than a private venture. Why publish, if not to be understood? And in the matter of understanding the audience has the big end. As Rosaline says to Lord Berowne:

> A jest's prosperity lies in the ear
> Of him that hears it.

Turning from presentation to content we may select as central the author's conviction that "the understanding of human nature is the beginning of wisdom" (p. 58). The method relied on for this understanding is deliberately speculative, experiential, rather than scientific, experimental. Anthropology, sociology, psychology, and other naturalistic accounts of man and his environment, are ruled out as unreliable approaches to insight, and are replaced by an attempted rationalistic synthesis of ethical, political, economic, legal experience. In the course of the investigation the human individual disappears as a reality in favor of a super-human corporate individual, and the argument is elaborated that the current social disorder, being due to the erroneous belief in a pluralism of individual wills, may be relieved, if not cured, by the appreciation of impersonal super-will as the ground of order.

According to Mr. Jordan the vitiating conception of social philosophy is the atomistic prejudice, the notion that in the search for the ultimately real we come at last to "isolable homogeneous entities". He contends against every attempt to conceive of human relations after the analogy of physical relations and of the human being as a distinct unit. This "logical fallacy of the simple" he finds ubiquitous. It is at the bottom of the social contract theory, the natural rights doctrine, individualistic and group sociology, introspective and separate instinct psychology, legal and economic conceptions,—in a word, at the bottom of social theory generally. The way he digs it up in unexpected hidden places is impressive. And his criticism is that simple elements ultimately distinct make inconceivable any process demanding unity. "You cannot have continuity after having postulated discontinuity as final" (p. 209). A citation dealing with one form of the fallacy will illustrate his point. It refers to McDougall and comes to this: "Given a mind made up of separate instincts,

there is no possibility of order or significant unity in either the personal or social life. The instinct psychology is thus a perversion of human nature, if human nature is to imply any reference to systematic order in reality. It can neither in its theoretical nor in its practical aspects be made consistent with human nature as rightly understood. No ethics or politics or law in the significant sense of those terms is possible when human nature is thus mutilated" (p. 54). Accordingly, the only unity attainable under this misconception is a pseudo-unity induced by some form of external power, illustrated in the mechanized life from which men at present suffer.

How, then, in the author's view, is this error to be amended? By beginning with and interpreting the actual unity everywhere given—an objective public universal life or general will as the datum of living experience (p. 64). "And this requires the discovery, within the existent, of the real as a functionally individuated practical whole" (p. 55). And again, "The ultimate fact is objective mind. It is from the outward aspects of life through the objective complication of ordered purposes, and not from the inwardness and distracted separateness of abstract uniqueness, that our insight into the reality of the order of life is to come" (p. 66). His position comes to nice formulation in his discussion of "The Organism as Corporate Individuality". Leaning upon the work of Jacques Loeb to the extent of adopting his teaching regarding the dominance of the life activities and structures by the organism as a whole, he objects to aspects of the isolable-unit fallacy which still cling to it. Loeb seems to the author to construct the organism out of atomistic physical and chemical impacts and physiological tropisms, and, more particularly, to conceive the organism itself as an isolable element, and hence to do logical violence to the wholeness of the organism as less acute investigators did and do to the organism's constituents. But he was at least on the right track. He was in search, even if unwittingly, of the right principle—the order of fact which is universal in every experience. The defect in him is that he fell short of understanding the full implication of his own emphasis. He did not perceive that the one characteristic fact with respect to the nature of the organism is *the continuity of the life of organisms* (p. 208). This means, from the standpoint of the author, that none of the important functions of the organism can be understood without being referred outward beyond the organism to the continuity of organisms. Organic functions are not explained by reference to the isolated organism. Interorganic functions are at the same time *intra* organic functions

(p. 211). It is the species then that is the ultimate fact, as the *law* of organisms. Then *organism* is the whole of law which specifies unities of fact in multilateral continuity. "Organisms are not wholes, in the elemental sense, but *organism is whole*" (p. 207).

It would be useless for me to attempt any criticism of the book. Mr. Jordan and I do not appear to inhabit the same world, and for all I know he may be correctly describing the world he lives in. Perhaps it is in place, however, to mention one or two matters which have left me wondering. One of these concerns the choice he offers —social disorder or back to the Greeks. In the Greek view of politics, he correctly holds, the sharp distinction between the individual and the social in human purpose did not exist. From this he concludes that the Greek was therefore able to apprehend what he calls the "objective natural wholeness" of the phenomena of life, and hence to arrive at a rational social order. We moderns, seeing the phenomena of life as a "scattered wilderness of warring fact", can only strain to achieve an artificial degree of order by sheer force of technical cunning (p. 41). The only promising social suggestions in our times, Bosanquet's for example, "are, as they must be, adaptations of the classical theories to the facts of modern life" (p. 57).

Now can this thing really be done? Will the graft of Greek theory take hold upon contemporary life? Is the program not a form of magic, which the author finds so prevalent in social philosophy and is so anxious to avoid? And if it *could* be done, *should* it be done? Should we attempt to win a saner life for men and women under our conditions by trying to see things as Plato saw them? Is it not the glory of Plato that instead of trying to adapt to his time what were classics to him he brought to fullest and rarest expression the unique moment of civilization we call Athens? On that account all who know him feel deeply in his debt. And I cannot but believe that our highest privilege as moderns (which after all we cannot help being) is to dedicate ourselves to creating, out of our own needs and circumstances, what we conceive to be human living at its best.

I wonder, too, about the two alternatives offered. Do they exhaust the possibilities? Nothing in the book puzzles me more than the way an alternative I set store by is disposed of. John Dewey has also thought about the conditions of a better social order, and Mr. Jordan finds merit in the attempt. Alas, it too is ruined by the separate unit fallacy. "Dewey's attempt", says the author, "seems to be the usual one to *make* social order out of subjective bits as parts" (p. 68). Moreover, Mr. Dewey is accused of embracing the

commonly accepted theory of a number of fixed instincts which, as we have seen, makes inconceivable the continuity of life functions (p. 69). If this is the right interpretation of Mr. Dewey then I understand him even less than I do Mr. Jordan. This is probably as it should be. Living in such different worlds we naturally read different things in books. Anyway, in the book to which Mr. Jordan refers, *Human Nature and Conduct*, Mr. Dewey seems to me to be teaching the very opposite of what he is accused of. Man is there presented as a complexity of active habits, and habits are regarded as social functions, unthinkable as processes within the skin of an insulated unit. What a man does and thinks are functions of the surroundings as truly as of himself. As for the question of separate instincts, Mr. Dewey says plainly that it is unscientific to stand for them (p. 31), and it has been my opinion that one of the most convincing arguments in the book is the section headed, "No Separate Instincts". The trouble is that Mr. Dewey sees not only unities, but distinctions; not only generals, but particulars; not only Society, but selves. I confess that I like his conception of social order better than Mr. Jordan's. "Within the flickering inconsequential acts of separate selves", as he says, "dwells a sense of the whole which claims and dignifies them. In its presence we put off mortality and live in the universal. The life of the community in which we live and have our being is the fit symbol of this relationship" (p. 331). I prefer this type of wholeness to the wholeness which swallows all its parts and threatens to swallow itself.

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Idealism as a Philosophy. By R. F. Alfred Hoernlé. New York, George H. Doran Company, 1927.—pp. xx, 330.

Few were the readers of Professor Hoernlé's *Studies in Contemporary Metaphysics* who did not leave the book eager for more of the freshly illuminating comments on the great problems of speculative thought with which they found its chapters replete. This eagerness was scarcely satisfied by his subsequent lectures on *Matter, Life, Mind, and God*, for, not to say that these lectures dwelt upon much the same theme as the earlier volume, their audience hardly permitted the depth of searching metaphysical analysis that students already initiated in philosophy seek and that the *Studies* so brilliantly revealed.

Now appears an expansion of the author's little 1924 volume *Idealism as a Philosophical Doctrine*, which extends this stimulating analysis in another direction. Although the book is designed for

elementary students in philosophy and consists mainly of an exposition and criticism of authors who have already been expounded and criticized by almost everybody else, Professor Hoernlé offers in it a wealth of original and constructive insight into the bearing of their thought on the persistent puzzles of metaphysics such as quite baffles the summarizing possibilities of a mere review. And the fruit of the author's study is presented in such simple, genial, forthright, non-technical fashion as is refreshing indeed to the general student of philosophy and almost disarming to the intended critic. The reader must turn to its pages if he would look through new eyes at a selected galaxy of modern philosophers, and whatever his other conclusions on finishing the volume he will certainly be convinced anew both that the great thinkers are inexhaustible and that one of the marks of a great thinker is his ability to reveal that fact in dealing with his predecessors.

Professor Hoernlé's purpose, he tells us in his Preface, was to provide "a book, which, like a map, would help a beginner to thread his way through the tangled mazes of idealistic theory". To this end he presents two introductory chapters on how to study philosophy and on the meanings of the terms "idea", "ideal", and "idealism", and follows these by four groups of chapters, each devoted to a type of idealistic theory which he holds should be recognized as fairly distinct. According to this analysis we have a section on Berkeley and James Ward, under the head of Spiritual Pluralism, one on Schopenhauer and Bergson, captioned Spiritual Monism, one on Kant as a Critical Idealist, and finally a more extended section on Absolute Idealism as represented mainly by Hegel and Bosanquet.

There is much in this classification that might arouse objection on the part of students of the history of philosophy, and an occasional historical point on which Professor Hoernlé's interpretation might be assailed, but the reader who is not such a loyal idealist as the author would be inclined to pass over these matters with the admission that Professor Hoernlé's critical judgment is at least as likely to be right as his, and concentrate his attention on the underlying assumptions which seem to be involved in the author's whole description of the nature and criterion of the philosophic quest. For there seems to be a lurking commitment to idealism in these assumptions which turns the whole course of reasoning into a circle when it is recognized.

The human need which expresses itself in the study of philosophy is described by Professor Hoernlé in the following terms (p. 23). "There is a deep-seated need in the human mind, the roots of which

strike far beneath all other needs and interests. This is the need to feel at home in the universe. From this source spring all philosophies and all religions, though it is only in the most highly developed philosophies and religions that we have become reflectively conscious of this need and of what it demands for its satisfaction. It is a need which at once demands to understand the universe and to approve—nay, to love it. It wants at once truth and perfection. It wants what men mean when they say 'God'."

Now that this is the need which expresses itself in idealistic philosophies we may readily grant, in fact we may find much cause for suspicion that it is because of succumbing to the control of this motive that the thinking of idealists eventuates in the particular interpretation of reality that characterizes idealism, and it is only perhaps by a quite unwarranted generalization from their own dominant interests that they assume that it is from this source that all philosophies spring. Certainly it is only in a highly attenuated sense as compared with this description that such philosophies as realism and pragmatism are seeking at-home-ness in the universe. They seek to be at home to the extent that as impartial an understanding as is possible yields a feeling of familiarity, but not at all to the extent of demanding that the universe be understood in such a way as to make it appear something to be unreservedly approved and loved. In fact, some philosophers might insist that control of one's thinking by such a motive as this latter would be sure to lead to a fallacious result, as rendering one partially or wholly blind to those features of reality that excite approbation only in an easygoing pantheist or fanatical Calvinist. From such a point of view it would accordingly be maintained as against Professor Hoernlé that the most highly developed philosophies and the ones most likely to be sound are those that have become reflectively conscious of this motive only to overcome it as far as possible, not at all to submit to it. To submit to it is to construct a theodicy, but a philosophy need not be a theodicy. Fortunately in his "Epilogue" Professor Hoernlé forswears consistency with his earlier statement and pens a fairer description of the philosophic motive—"to philosophize is to 'think for thinking's sake', to have no other goal and seek no other reward than the greatest intellectual satisfaction, *i.e.*, the profoundest and most complete insight, which the study of its subject-matter is capable of yielding" (p. 301).

The question needing attack then is: What are the basic motives which express themselves in different types of philosophy, and how

can we evaluate them in such a way as to reveal clearly the kind of motive that can be expected to issue in a permanently satisfactory result? It is failure to grapple with this question that renders non-idealistic as well as idealistic philosophies today so empty when it comes to the central problem of the criterion of philosophic truth.

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The Philosophy of Personalism. A Study in the Metaphysics of Religion. By ALBERT C. KNUDSON. The Abingdon Press, New York and Cincinnati, 1927.—pp. 438.

This book by the Dean of Boston University School of Theology is "an exposition of personalism in the light of its historical development and in the light of contemporary philosophy". While the "main purpose of the book is critical and constructive" it also seeks to "commend to the reader a type of philosophy that meets the needs of both the theoretical and the practical reason". Personalism is presented as a system which will "save philosophy from shallowness and futility, and it will also help to remove many of the common objections to the higher beliefs and hopes of mankind" (Preface, pp. 13–14). The sub-title calls the book a study in the metaphysics of religion. Its emphasis on the importance of belief and the attitude of faith, and its preoccupation throughout with those aspects of experience which are vaguely denominated "life" and which are affirmed to be "deeper than logic", would seem to classify it as primarily of religious rather than of philosophical interest, in spite of the fact that it claims to represent a type of philosophy so well-defined as to require a distinguishing name. The author's first task is to define personalism. This he undertakes by connecting the point of view with those philosophies chiefly of modern and recent times which have made use of the concepts of person and individual; but a clear distinction of these terms is hardly anywhere effected. Inadequate, "purely" teleological forms of personalism are the atheistic, pantheistic, absolutistic, and relativistic. These, however, enable the author to approach the "typical theistic personalism", which has its sources in Leibniz, Berkeley, Kant, and Lotze, and which differs from the inadequate types in that it "bears a greater affinity to traditional theism" (p. 64), which the author appears to accept as criterion. The finite person, which obviously means the bio-psychological or human individual interpreted in terms of self-consciousness with merely its subjective implications, is "a sample or specimen of what reality is" for the form of personalism which the author desires

to recommend. For personalism, "nature has no independent forces resident in itself. It is 'nothing more than the orderly and continuous intervention of God', a ceaseless product of the divine energizing" (p. 77). The doctrine reaches its final form in "systematic methodological personalism", which is a "complete metaphysical system" whose principle is "that the categories of thought do not explain intelligence but are explained by it". This consummation of human thought is the contribution of Borden P. Bowne (pp. 85–86).

Chapter II presents the personalist's theory of knowledge. Here also the "higher faith of mankind" is the criterion. In personality there is "something deeper, broader, and more divine than the perceptual or logical faculty" (p. 98). Idea and object are identical "from the metaphysical standpoint" in self-knowledge and self-experience (pp. 110–111). Yet the validity of knowledge is an assumption (140), and, as such, a matter of faith. Reason, that is, is founded on faith and faith is a free act, and, as such, ultimate (147). But as the individual's freedom implies an objective world which can never be identified with his knowledge, a situation is presented which makes "theistic monism the ultimate solution of the problem of knowledge" (153).

Chapter III states the personalist's theory of reality. "True metaphysical reality", which consists in the "unifying and self-identifying activity of consciousness" is "given to us". "We do not create it, we find it." But as given it is recognized as active, an agent, and "causality must ultimately be interpreted in terms of volition" (178). This ultimate cause which is also will is probably what the author means by "the divine energizing" (pp. 77, 178, 232). Reality is then personal, and the problem becomes one of the nature of the individual. Individuals are "completely isolated" and "act by virtue of forces resident in themselves". No two of them are alike, and there is no common substance in the common monads. The essence of the individual lies in its "form of action"; it is "something subjective", a "unitary agent", possesses "real causality", and it is in self-experience that the separateness or isolation of the individual finds its true source and being (pp. 185–187). However, the Leibnizian attempt to account for the unity of things proved unsatisfactory, the independence of things is not consistent with their necessary unity in a world. This situation also apparently calls for faith: "Only as we transcend the independence of things and affirm their common dependence upon a unitary and independent Being can we affirm their interaction" (199). "It is indeed a mystery"

(200). "It is in personality that individuality finds its only adequate realization" (p. 237). The problems of reality find their solution in our self-experience (p. 244).

Chapter IV undertakes to show that personalism is "in a pre-eminent sense the philosophy of religion of our day. It may be said to be the most thorough-going philosophical expression that Christianity has yet received" (p. 247). To cast doubt upon the trustworthiness of religion would be "to discredit all the higher faiths of men. Religion then may be accepted as autonomously valid. . . . What gives dynamic to all argument in defence of religion is the unreasoned faith that lies back of it" (p. 252). This sort of thing is characteristic of the argument throughout. It does not seem to call for comment. But it seems rather strange that the author should think it necessary to supply some eighty pages of argument for personalism and its consistency with religion, most of which has to do with the traditional arguments for the existence of God, after accepting such assumptions. And, as the ultimate of personalism is the self-sufficiency of subjective experience, the existence of God or of any required type of reality is not a difficult matter, since "what we find within ourselves we are justified in seeking in the objective world" (p. 288). Seek and ye shall find. With a robust religious faith to begin with there is little difficulty in finding what is required in the objective world, since "the human need or capacity, expressed in religion . . . carries its validity in itself" (p. 251).

A chapter on "militant personalism" follows in which the author offers a criticism of the prevailing types of philosophical system from the personalist point of view. But the chapter exhibits more of the zeal of the soldier of the cross than of the balanced judgment of the philosopher. The argument seems impatient in its longing to 'possess' the truth: "All that personalism claims is that it represents the line of least resistance to thought." It also "has this advantage over most of its rivals, that it assures us that, where knowledge fails, we may believe" (p. 428). Yet "Its uniqueness consists in the greater logical thoroughness with which it has carried out the theistic idea" (p. 428).

This statement of the argument of the book may, as it seems to me, serve as a criticism of the point of view which it seeks to set forth. The book appears to be simply a reformulation, in traditional theistic terms, albeit here and there softened with fairly good modern rhetoric, of the subjective and interested individualism which has served as a practical concept for western culture during the past

four hundred years, and it represents rather faithfully the curious mixture of religious emotionalism and cultural rationalism which characterized the period throughout and finally brought it near collapse in 'democracy'. But the author seems to be unaware that the subjective motive reached its peak somewhere in the first half of the XIXth century and that there followed the most important critical and constructive development of practical theory since Aristotle in the critical and objective individualism which grew out of the visions of Hegel. The upshot of this movement was that the concepts of individual and person completely changed their centers of reference, and now find their reality in the 'impersonal' and superpersonal individualities of social and institutional life. Individuality, in fact, is now conceived in terms of corporate order; and the concept is of such broad significance that it is even making its way into the logic of natural science. It is true, of course, that official philosophical formulations still remain true, in the main, to the Berkeleian and Kantian psychology; but this means only that the real development of practical concepts has been left to juristic and political philosophy. Thus Hegel and Kant, in order to attain objectivity in the practical philosophy of individualism, had to resort to the concepts of law and politics; and the religious interest, in search of objectivity, led Ritchl and Figgis to translate religious reality into 'social' and political terms. And Green, when he undertook to find objectivity for the phenomena of the moral life, was constrained to turn to practical politics to find the grounds of morality in political obligation. But the philosophy of personalism seems to be unaware of all this; it appears to know nothing of the vast critical literature created by jurists, politicians, and moralists, in which the person and the individual have undergone transubstantiation.

Another general criticism seems pertinent in connection with the reading of this book; it is stated in the question What, anyhow, is to be meant by a philosophy of religion? For those with religious motives it appears to mean a religious philosophy: that is, a philosophy made to conform to the requirements of religious faith and tradition. But a philosophy of religion would be essentially a critical examination by the methods of philosophy of the grounds of religious faith, as these grounds lie in the substance of practical reality. And the fact that such an examination, where it has been candidly resorted to, has resulted more or less disastrously for the faith out of which the examination grew, has uniformly led religion to attack philosophy for answering the questions it itself posed. It is true that the attack

has generally been screened by an often sincere gesture of acceptance of philosophical method, but there has been withal a subordination of logical accuracy to the rhetorical necessities of a faith which declines to ask any questions at all. A philosophy of religion is an attempt to translate the content of religious experience into consistency with the principles of a knowably objective world, just as is the philosophy of anything else. And the fact that such a move toward consistency divests the object of faith of everything but a subjective substance which lacks circumstantiation in a world realized through the postulates of the practical life, leaves religion with no approach to the bar of validity except a slavering gesture of ingratiation or an attitude of forgiving superiority. Dean Knudson's personalism tries both. There can very well be a profound sympathy for philosophy of religion as an attempt at theoretic formulation of the practical life with respect to transsubjective values; but while practical philosophy has fallen among pragmatists, 'religionists', and other interested purveyors of the spiritual realm, the genuinely objective interests of the practical life have had to look to juristic and political theory for philosophic formulation.

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Das Verstehen: Grundzüge einer Geschichte der hermeneutischen Theorie im 19. Jahrhundert. I. Die grossen Systeme. Von JOACHIM WACH. Tübingen, J. C. B. Mohr (Paul Siebeck), 1926.—pp. viii, 266.

The method of scholarly interpretation and criticism is a study that is little cultivated in America, perhaps less in England, more (at least with respect to history) in France, and most in Germany. This solid work of Wach should do much good if it were properly introduced to our literary and linguistic, and historical, scholars; but I suppose most of these persons in America and England will continue to muddle along at their tasks, in a 'practical' fashion, without much care for the ultimate nature of what they are doing. Our 'philologists' are content with proximate ends, and the obvious means thereto. It is significant that Wach finds but one important English treatise to mention, Farrar's *History of Interpretation*, 1886, which he says is little-known in Germany, and which certainly has been neglected in America. Wach might, it seems, have paid more attention to the French Encyclopædists, and to their forerunners in Italy, and so have taken us back through the Middle Ages and the Fathers to Alexandrian scholarship, and thence to Aristotle and Plato.

But he is not unjustified in limiting himself to the methodologists

of central Europe. The main course of methodology in recent times lies through German writers; the great body of writings on the subject is in German or the Latin of Germans. We had been taught that the greatest systematic treatise in its field, Boeckh's *Encyklopädie und Methodologie der philologischen Wissenschaften*, was produced by Boeckh partly through the stimulus of Goethe. Wach, after duly stressing the importance of Biblical hermeneutics from the time of the Reformation down, shows the preponderant effect of Schleiermacher in the philosophical development of a theory of interpretation, and the powerful influence of Schleiermacher upon Boeckh himself. The immediate forerunners of Schleiermacher were Ast and Wolf. Ast, a Platonist, now too little remembered, had a better philosophical head than Wolf, whose comprehensive scheme of studies for an understanding of the life of Greece and Rome was somewhat chaotic. Wach devotes some 30 pages to Ast; 20 to Wolf; 85 to Schleiermacher; 60 to Boeckh; and 40 to a reconstruction of the theory of Wilhelm von Humboldt, who constantly reverted to the problems of interpretation, but published no systematic work on the subject.

Wach thinks Boeckh less inclusive in his view than Schleiermacher, because Boeckh confined his *Encyklopädie* to the interpretation of Classical Antiquity. That is hardly fair. Boeckh's thought is absolutely generalized, and becomes the more vital through its specific application, while attaining clarity and distinctness through its logical division. His system is better balanced than any of the others, including that of Wach himself, because of Boeckh's distinction between the process of interpretation (the understanding of a thing in and for itself) and the process of criticism (the understanding of a thing in relation to other things, and to a standard derived from all of them). And his fourfold distinction of Grammatical, Historical, Individual, and Generic Interpretation (repeated for Criticism) will always remain valid; we must, for example, understand a poem, first with respect to the words and syntax of it, then with respect to its historical setting, then with respect to the individuality of the poet, and finally—so to speak, finally, since the fourfold activities are conjoint and endlessly interpenetrating—with respect to the kind of poem it is, whether lyric, epic, or dramatic; and we must criticize or judge the poem in the same fourfold way.

Boeckh is not general enough for Wach (p. 25); he is too general for some more recent systematizers like Paul in the *Grundriss der germanischen Philologie*. Yet Wach is enthusiastic when he comes to his section on Boeckh. And that is well. How much fog would be

dispersed if writers such as Matthew Arnold and Croce, and yet more the followers of Croce, had made the *Encyklopädie* an intrinsic part of their mental furniture! How soon the study of Boeckh would quiet the debates over the means and ends of 'appreciation' and 'criticism'; the debates arise because the difference between *interpretation* and *criticism* is neither affirmed nor understood. But the first task of understanding would seem to be the Platonic effort to define our general terms.

Professor Gildersleeve used to remark that, when his head needed clearing, he got down the volume of his old teacher, and a few minutes' reading brought his mind into order again. Toward the close of his life he wrote (*Hellas and Hesperia*, p. 42): "Boeckh was a great master, the greatest living master of Hellenic studies, and if I became after a fashion a Hellenist, it was due not merely to the catalytic effect of his presence, but to the orbed completeness of the ideal he evoked."

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Jahrbuch für Philosophie und phänomenologische Forschung. Herausgegeben von Edmund Husserl. Achter Band. Halle, Max Niemeyer Verlag, 1927.—pp. xii, 809. Aufsätze: *Sein und Zeit* von Martin Heidegger; *Mathematische Existenz* von Oskar Becker.

A volume so lengthy, so difficult, and so full of novel conceptions, as this, cannot properly be summarized in brief terms. More even than is usually the case the function of review must here be to send the reader to the book itself, by conveying the reviewer's impression of its importance, and of its relevance to current issues. The appearance of this volume is no ordinary event, nor since the *Ideen* of Husserl has the latter's *Jahrbuch*, or perhaps any recent philosophical publication in Germany, presented such interesting material.

The first requisite is to locate the philosophical tendency involved, full of apparent idiosyncrasies as it is, in the general context and movement of current thought as a whole.

Contemporary philosophy, wherever it is most fertile and living, appears to be characterized by one and the same dominant conviction. This conviction is that abstractions have exactly so much meaning as concrete perceptions and concretely identifiable human activities —scientific experiments, mathematical 'operations', the conversation of friends—can give them; and that the sole function which words can perform is to intensify, control, and render publicly communicable, such perceptual or practical experiences. The importance of the

latter, the practical side—and even its predominance over the merely perceptual,—in providing the content of intellectual conceptions, was first brought out with any approach to clearness by the late Charles S. Peirce, the founder of Pragmatism, and in some respects our greatest American philosopher. In published, and with even greater force in as yet unpublished writings, Peirce pointed out that the most general conceptions must either be dismissed as "ultimate", "simple" ideas, opaque to all rational interpretation and thus really without scientifically verifiable meaning, or else must be interpreted through those "concrete and familiar conceptions of everyday life" which express modes of human behavior and human purpose. This represented a profound transformation of traditional empiricism.

A somewhat similar reform of that vigorous branch of neo-empiricism which goes in Germany by the name of Phenomenology has been undertaken (independently enough, one suspects) by the first of the two contributors to the present volume. True, Phenomenology was itself from the outset reform, and reform tending in the very direction we have been considering,—the direction, as we conceive it, of ever greater concreteness. Still, phenomenologists hitherto have tended to a disappointing extent to interpret experience chiefly in terms of such traditional and relatively abstract conceptions as 'consciousness', 'object', 'essence', 'perception', and the like, to the neglect of the concreter ideas of *feeling*, *willing*, *valuing*, *loving*, *hating*, and their kin. As Professor Whitehead would phrase it, they have committed the "fallacy of misplaced concreteness": that is to say, since by abstract we mean indeterminate in respects which a more concrete mode of representation would 'fill in' or render determinate, they have tended to take as the most fundamental and all-explanatory ideas those which are the least determinate in their meaning. In other words they have sought to explain the definite by the indefinite. Thus bare 'consciousness' or even 'consciousness of' (Husserl's *Intentionalität*) conveys no conception of what is meant by 'loving', but 'loving' does convey some conception of 'consciousness'. It is at least not mathematically impossible that all consciousness should be —as many mystics and some philosophers have held—an activity of loving at least so far as to involve something like sympathy; and this, if true, is genuinely informative. But to say that all loving is a state of consciousness is either a mere tautology, or, if it means that love can be reduced to, or really understood in terms of, such abstractions as 'contents of consciousness', then, as the phenomenologist Scheler, in his *Wesen und Formen der Sympathie*, has shown,

it is false and commits the fallacy in question. It is easy to render concepts general by rendering them empty, but if there is no other possible mode of generalization, then philosophy and all science with it is likewise empty of meaning. Berkeley's attack upon "*abstract* general ideas" is worthy of perpetual renewal, however changed the form of this attack must be.

I. Being and Time. The program of Martin Heidegger, in "*Sein und Zeit*", is the interpretation of the initially abstract, empty, and supposedly indefinable concept of "Being" in terms of "phenomena", *i.e.*, immediate appearances. The traditional doctrine of the emptiness and the "not further analyzable" or self-evident character of this concept is criticized, together with the doctrine of logical definition —by genus and specific difference—upon which in part it rests. (The rejection of this latter doctrine by a great logician, was, it is interesting to note, centrally involved in the origin, above referred to, of American Pragmatism.) The effect of this conception of Being is shown to have been simply the neglect of precisely the fundamental philosophical problem, the problem of ontology. Heidegger then points out that because phenomena are immediate, it does not follow that they or their characters, even as immediate, are obvious. Here the disciple goes far more subtly into the matter than his master, Husserl, in showing us that there is a quality of obscurity in immediacy itself, so that the really and directly given may not for all that be at all readily detected in an explicit, conscious judgment, such as alone can enrich philosophy. Consciously we see what we are prepared to see, and we are prepared to see for the most part only what our inherited traditions assert to be there. Thus Heidegger well shows how modern philosophy has been led to see phenomena only as 'data', as mere indifferently registered items or termini of awareness (the latter conceived as an aimless transparency of pure givenness), and to interpret 'Being' in an equally abstract and negative fashion—all because of the overstrained ideal of *absolute* knowledge (such as only mathematics, that abstractest of sciences, can realize) which reigns in modern philosophy from Descartes and Spinoza down to—Husserl himself!

But how, then, shall a more positive conception of Being be attained?

A universal category (such as Being) cannot be clarified by distinguishing between phenomena which do and those which do not stand to it as instances, since the latter class is null; but only, if at

all, by specifying phenomena which are peculiarly adequate illustrations of its meaning. Being appears in all things, but perhaps not equally clearly or with equal fulness in all of them.

The search must be, then, for some *especially privileged* instances of being. The test of the privileged instance is that the less privileged can be seen to involve the same principles, only in a 'deficient' manner—that is, one infers, with less clearness or intensity. Heidegger is here employing a mode of analysis the logical principles of which he does not perhaps fully explain. One of these principles is that no concept can be so ultimate or 'simple' as not to have a structure, that indeed structure itself is ultimate and all-pervasive. From this it follows that Being is not a simple something at which we can only gape and stare, but an organic unity of aspects. As thus structural, Being can be *explicated* or described, by taking in turn phenomena in which now this, now that, structural aspect is peculiarly striking, though every aspect is inalienably present in some measure in every phenomenon.

The starting point is human consciousness ("*Dasein*"), for that is the mode of Being possessed by the question concerning Being, and critical questioning examines first into its own ontological conditions. What are the phenomenal characters which constitute the Being of consciousness? There is first of all the character of self-significance, illustrated by the fact that consciousness questions itself concerning its own Being. Consciousness is "Being that matters to itself as such" (*Sein das um es selbst geht*). Not a reflecting mirror, but an active *concern*, is its character as concretely given. And in the second place, it is essentially "Being-in-a-world". The sense of an environment is not something additional to consciousness, to be justified by epistemological arguments, but one of its structural characters, to be recognized in a description of what is immediately observed.

In order to show how the "world" itself is phenomenon, Heidegger examines the manner in which things "in" the world are phenomena, and finds the ordinary conception of things as merely registered in consciousness, and of the latter as an indifferent mirror or stream, to be a "deficient" form of a more basic relationship which he calls "*Zuhandenheit*", and which involves an active and practical functioning of consciousness. Things are there first of all as *usable* in certain ways, and only by a sort of pseudo-purification from such practical reference can the illusion arise of their being merely "there". So *things in* the world. But the world itself is not just another usable thing. It is rather the total context of means-use-end, to

which all particular use of means refers. The world is that unity of purposive significance whereby means contribute to ulterior ends; also whereby signs indicate things signified. Meaning, the more abstract (*i.e.*, indeterminate) is here explained by purpose, the more concrete, determinate conception. A subtle instance of the same principle of concrete interpretation is that of space. As what are "near" and "far" really given? As Heidegger reminds us, the person on the other side of the street to whom one calls out is "nearer" in the phenomenological sense, *i.e.* as appearance, than the pavement upon which one stands or the glasses on one's nose. The near is that with which consciousness is intimately concerned. Like most matters in this monograph, the point is too subtle for brief reproduction.

Included in the world-context, as "in" which things are phenomena, is an inalienable reference to other consciousness (*Mitdasein*). For the *Zuhandenheit* or usefulness of things to others is as immediately given as their usefulness to self. The point is interestingly if somewhat obscurely made. More developed and profoundly original is the treatment of *conscience* as the central revelation of the self, and of the manner in which the deeper nature of the self is inevitably more or less overlaid and obscured in life and in thought by a specious substitute, the public or impersonal self, the "one" (*das Man*). Here Kierkegaarde is a potent influence upon Heidegger's thought. The structure of consciousness, as Being par excellence, is summed up in the term "*Sorge*". Being is "concern", *for* itself as such, *about* things, and *for* other selves, all in the unity of a single function. This function, the *Sorge*, can only be articulated by calling upon the most concrete phenomena possible, such as those of affective sensitivity and emotional attitude—especially fear and anxiety, including the fear of death—or such as phenomena of conscience, and many another not usually thought of prime importance for ontology. The whole analysis culminates in a perspective of consciousness as *Sorge* from the standpoint of its *temporal* structure. The always difficult terminology here becomes so complicated that the present reviewer confesses himself repelled from attempting to arrive at any accurate understanding of what is set forth in these hundred and forty concluding pages. Yet it is clear that this is one of the most ambitious analyses of time that has ever been made, and of the general type which the nisus of contemporary thought suggests.

The entire monograph is but the first half of the work ultimately projected by its author.

In attempting to evaluate such a contribution as this, a non-German reviewer or reader faces formidable difficulties. The goal of concreteness appears to justify frequent resort to extremely idiomatic and vernacular German; for it is in such expressions that the fulness of experience is most vividly expressed. But this means that the task is a different one for every language, and that only a native could derive the full benefit from the results in each case. Undoubtedly, Heidegger will teach much to his fellow countrymen. He is the most subtle and painstaking, perhaps the most original and profound, of all contemporary German philosophers known to the present writer. And he is, moreover, a young man. One wonders only if some of his subtlety is not hair-splitting or pedantry, tending to obscure the main outlines of his thought, and to prevent its attaining the classic simplicity of the greatest thinkers. One wonders also if much of his originality is not rather oddness, a new manner of speech, than novelty in fundamental conceptions. But of the profound penetration of his thought, and the heroic striving for accuracy with which it is expressed, the present writer stands admiringly convinced. He wishes principally two things: (1) that a more positive conception of the relation of philosophy to mathematics—*via* the concept of structure or logical form, which falls within the province of pure mathematics—had enabled the author to give greater precision and explicitness to his analysis; and (2) that a greater interest in and sensitiveness to *æsthetic* phenomena, so obviously relevant to such a philosophical program, had contributed their quota to the concreteness of the results. The first would have brought out the relationship of the new or "hermeneutic" Phenomenology, on its logical side, to the logic of relations and kindred logical issues, as treated in the writings of Peirce, Russell, or Cassirer; while the second would have tended to correct the one-sided emphasis upon the *practical* accent in the description of physical objectivity. Perhaps, even, it might have led to the perception of an obvious lacuna in all philosophy of the type in question, as so far developed.

If the *whole being* of consciousness, which is Being itself, is "*Sorge*", that is to say concern, rather than mirror-like reflection, then even the most apparently indifferent data of consciousness, the external sensory qualities themselves, must express the structure of the *Sorge* in their very essence. The fundamental aspects of irreducible sociality, emotional tone, and practicality, characterizing the *Sorge*, must be discoverable *in* the qualities revealed to the several senses. Only the barest hints of such a conception can be found elsewhere in

contemporary philosophical literature—although language and ordinary speech, with its 'gay colors', 'kindly voice', 'powers of darkness', and an infinity of other kindred expressions, reeks with them,—yet no device is apparent whereby the negation of such a view can be rendered consistent with the type of philosophical conclusions we have been considering. In a very general way Heidegger doubtless conceives the matter so, and he emphasizes explicitly the essential role of affective sensitivity and emotional tone (*Befindlichkeit und Stimmung*) as the conditions of our being aware of phenomena at all. Moreover, the fundamental character of presented things, as such, is, according to him, their *Bedeutsamkeit*, their significance as *besorgt*. And if, in fact, consciousness is not registrative awareness to which a factor of "concern" has been added, but a concern of which registration ("*pures Vorhandensein*") is merely the emptiest or vaguest possible conception, then correspondingly colors and sounds are not mere indifferent primary or secondary qualities to which concernful content (affective tonalities, "tertiary qualities") becomes attached or "associated", but must rather *consist* of such affective or æsthetic tonalities. Such a consequence must sooner or later be drawn, so obvious does it appear. When it is drawn, it will be met by the same charge of unscientific extravagance as must in many minds be elicited by any philosophy of this type. But the Heideggerian is prepared; for a principal consequence of the character of Existence as *Sorge* is that the *Sorge* tends inevitably through practical obsessions to become obscured from itself. This is the phenomenon of "*Verfall*". The remedy is found, according to Heidegger, in the consideration of such experiences as conscience, the foreboding of death, and the consciousness of time. But why not also in the consideration of æsthetic enjoyment, which also transcends the narrowly practical? Heidegger, however, appears to conceive phenomena too exclusively in terms of practical and subjectively emotional attitudes, and too little in terms of that relatively objective participation which is æsthetic enjoyment.

Perhaps the two finally outstanding impressions left in the mind of the reader of Heidegger are on the one hand the respect produced by the completeness with which, as just mentioned, the inevitability of views opposed to his own is deduced, and the acuteness, not to say *slyness*, with which their motivation is laid bare; and on the other hand the admiration mixed with bewilderment occasioned by the marvellous virtuosity of the German language in expressing philosophical subtleties. Not since Hegel has such use—for good and

perhaps ill—been made of this plastic and flexible power. There is a sort of grim playfulness in it, soberer and more responsible than the 'triple brass' self-assurance and waywardness of Hegel, but not less inconceivable in any but the German tongue, in any but a German mind.

As for the technical import of the new Phenomenology, a really adequate study of it, at least by a non-German, would call for more heroic labors than the foregoing review can pretend to represent, possibly than any student will find it altogether worth his while to attempt. Yet there is more than philosophical brilliance to reward him; there is, I think, genius.

II. Mathematical Existence. On this essay, rich in thought as it is, a few notes must suffice.

It appears that a conflict has arisen between two groups of European mathematicians concerning the ultimate significance of mathematical concepts. The "Intuitionists", particularly Weyl and Brouwer (the former at least having been influenced by "phenomenological" writings), hold that the symbols of mathematics must express relationships capable of perceptual embodiment; while the "formalists"—especially Hilbert—maintain that the sole requirement is that the symbols should be manipulated in a self-consistent manner. In the latter case, everything depends upon the *demonstration* of the alleged consistency; in the former, upon the *discovery* of phenomena in which the ideal structures in question are realized and exhibited. The difficulty is perhaps to see why the manipulated symbols of the formalists are not as much phenomena as anything else. The test case is that of an infinite series, of whatever type. For an infinite set of entities appears never to be exhibited in phenomena so far as accessible to human consciousness. The formalists offer proof that the principles definitive of finite series can without inconsistency be used to define infinite series. The intuitionists, and our author, Becker, reply by showing that the conception of infinity is unwittingly taken for granted in the proof, and press home the fact that as the manipulation of symbols is always of a finite complexity, the aspect of infinity cannot be given meaning in terms of actualized symbolic operations or combinations, but only in terms of possibility, of what *might* be done with the symbols. If it be objected that what might be done must already "exist" as a possibility, the answer is that this is to interpret the concretely known and determinate—say the endless further extensibility of the number system—by means of

conceptions wholly problematic if not merely verbal,—such as the alleged completed "existence" of "all" numbers. Thus we find Becker applying the same principle of concrete interpretation as his predecessor in this volume, applying it, however, to the most abstract of all subject-matters, the conceptions of pure mathematics.

Becker discusses critically and in detail, without completely agreeing with either side, the issues involved in the intuitionist and formalist definitions of infinity and continuity. The intuitionist theories of Weyl and Brouwer are the less well-known, and involve the conception of the infinite not as a set whose membership is completed but as an essentially endless *becoming* of members all of whom cannot *have* become, even so far as to "exist" with logically distinct being or identity. Formally this means a limitation upon the application of the principle of excluded middle; philosophically, it is held to imply the centrality, even in the world of "eternal" and necessary relationships of pure mathematics, of an element of *creativity*, implicative of genuine contingency ("free choice") and of the category of time. The re-admission of time recalls Kant's doctrine of number, as Becker points out, and we may further note that it is in harmony with the temporalistic tendency of contemporary thought.

The Weyl-Brouwer conception of continuity involves all of these motives, and is in principle the conception of Aristotle. In more recent times, it was again Charles Peirce, a mathematical as well as philosophical genius, who most fully anticipated the new view. Peirce presented a *mathematical* proof for the Aristotelian thesis that a continuous series was not a collection of individually distinct entities (*à la* Cantor), but a general possibility of endless further determination of parts. But to this mathematical proposition he gave a philosophical bearing by his powerful arguments in support of the identification, with respect to formal characters, of mathematical continuity and logical universality. For from this identification, together with the proposed definition of continuity, it follows that "universals"—and ultimately, the one wholly general universal of Being itself—express ranges of possibility, indefinitely *divisible* (but *not divided*) into distinct (relatively particular) possibilities. In other words, essences as such are not eternal and necessary, but rather contingent creations out of a primordial unity or continuum which is eternally and necessarily *capable* of free differentiation into qualitative distinctions *greater in number than can be represented by the diversity of any completed universe or realm, real or ideal.* Thus arises a sort of third alternative to ordinary nominalism and realism, intimately relevant,

as we learn from Becker's report, to recent mathematical theory. The work of Peirce on this and other relevant topics is mostly to be found in manuscripts which are now being edited for publication, and consequently there is no mention of it by Becker. But certainly that work would add to the philosophical interest of the contemporary mathematical controversy.

Becker's account and criticism of the theories of the mathematicians is followed by an independent and elaborate investigation into the phenomenological interpretation of the concept of mathematical existence, an investigation which moves on somewhat Heideggerian lines (with full acknowledgement of indebtedness to that author) and includes an historical survey of the philosophical speculations on the subject.

The essay appears to draw upon a vast range of mathematical and philosophical reading, and, in the opinion of an untechnical reviewer, is a contribution of real value. There is much here for the technician —mathematical or logical—and much also for all who are interested in the interpretation of abstractions as functions in the intellectual *life* of man.

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The Function and Forms of Thought. By ALBERT E. AVEY. New York, Henry Holt and Company, 1927.—pp. 395.

An attempt to rewrite logic and bring the elementary text into line with recent developments is made in Professor Avey's *Function and Forms of Thought.* Instead of regarding symbolic logic as something to be added to the more traditional treatment, this book seeks to lead naturally into symbolic logic and to absorb the old in the new. After all, deductive logic has always been more or less symbolic, and recent studies have merely made it more thoroughly and rigorously so. A work such as Mr. Avey's has been long overdue and will be widely welcomed.

The book covers the whole field usually dealt with in the elementary texts, but the point of view and the purpose mark it as a new venture and a genuine contribution to the teaching of logic. Moreover a streak of originality characterizes the work both in the material and in the integration of the parts. The text begins with several chapters devoted to what frequently comes last, *viz.* the function of thoughts the meaning and tests of truth, and the means of knowing. It end, with what is found frequently in the first chapter, a brief history of

logic. This order is no doubt sound pedagogically. Deductive logic takes on significance when the student feels that it is an essential tool in the enterprise of finding and testing truth. After he knows something about logic he may be interested in knowing how it grew.

There are many interesting examples of originality in integrating material from the author's particular point of view, and of assimilating the older material to the symbolic logic. Classification and division are treated as illustrations of the expansion of terms—a mathematical as opposed to a biological point of view. Analogy and methods of induction are removed from their usual place of prominence and are treated in the chapter on equalities. Arguments from analogy, in so far as they are valid, are shown to depend on identities or equivalences. Mill's canons are also shown to depend for their validity on strictly equivalent elements, and to be even then imperfect and fallacious. Hypothetical and alternative reasoning is very properly tied up with scientific hypothesis and the elimination of alternatives. Averages, correlations, etc., are treated as numerical applications of the more elementary symbolic principles. The chapter on probability is particularly good. These and similar topics do more than illustrate the author's particular perspective; they reveal the rigorous, formal basis that underlies the strict application of scientific methods.

In the chapters on truth Professor Avey sets forth his general point of view as "absolute pragmatism". "The Laws of Logic are conceived to be the general principles which give the greatest success in thinking. Man has learned no way to do without them. For him they are absolute. And since in dealing with the real world these are the principles which work best they must be akin to its structure and its modes of operation" (pp. 39–40). This is the meeting ground of pragmatism and idealism when we carry James' "on the whole and in the long run" far enough. Absolute knowledge is retained only as an ideal or limiting concept. General principles can be arrived at by four distinct methods: (1) induction, (2) postulation, (3) reflexion, (4) deduction. To the reviewer it would appear that induction, deduction, and reflexion, in so far as they are conscious logical processes are all based on postulation. Appearing as they do in the first few chapters of the student's first course in logic, these controversial and profound questions must be dealt with in a summary manner.

Professor Avey does not intend this text to carry the student very far into symbolic logic, but rather to give him a foundation which will lead him naturally into the more advanced studies. Any criticism must keep this in mind. Even so it is doubtful if the text is wholly

successful. Many teachers would have preferred a standardization of one of the many existing systems of symbolization rather than one with several new features. Personally I would have preferred a standardization of the symbolism of the *Principia Mathematica*, somewhat simplified, and combined, for classes, with the equation to zero. The use of the same symbol for class inclusion and for implication is justified by the author on the grounds of related or identical properties. I am inclined to think, however, that this is not only confusing to the student but gives rise to confused thinking. Professor Avey himself seems to me to have fallen into error on this account. "Implication", he says, "is a relation which holds between *propositions*, in such a way that if one is true the second is true" (p. 182). On the next page we find: "$p < 1$. Every proposition implies the existence of the universe of discourse." Now the symbol "1" is not a proposition, and it is incorrect to say that *p implies 1*. Nor is it a correct interpretation to read it "*p is included in 1*", for the elements of the universe of discourse are regarded as terms, not as propositions. Similarly we have the ambiguous and incorrect formulas: $0 < p$, $1 < p + p'$, $pp' < 0$. These confusions were pointed out by McColl long ago, but were overcome by the more elaborate and precise symbolism of the *Principia*.

The treatment of the categorical syllogism is disappointing, and again I would attribute the defects to the symbolism employed. It is based on the traditional "distribution of terms", and rests on the five "laws". The purely arbitrary distinction between major and minor terms must be maintained, and the lingo of illicit majors and illicit minors and undistributed middles must be learned, never to be used again as long as the student lives. Even the mnemonic verse is introduced and explained. The laws and processes must be taken on faith and woodenly applied, or grasped intuitively and uncritically. There is no rigidity of proof, and no tool of analysis which would give the student a feeling of power over complicated arguments. The Boole-Schroeder algebra with its equation to zero, its elimination of x, or its solution for x, and the Ladd-Franklin formula with its inconsistent triad, should be added by the teacher, or substituted by him for the treatment in the text. Without these it is difficult to see how the student can approach the interesting but complicated problems collected at the end of the book.

On the whole my criticism would be that while there is considerable show of introducing the symbolic logic, the heart and soul of symbolic logic is omitted. The life and beauty of logic consists in the building

up of systematic structures from stated assumptions by simple operations. Even if completeness and unity are impossible in an elementary text, it would be quite possible to build up a series of theorems of the Boole-Schroeder logic of classes, and a portion of the calculus of propositions. The categorical syllogism would follow naturally from the first, and hypothetical and alternative syllogisms would be included in the second. The author, on the other hand, has been content to list the properties of classes in a well selected set of formulas, explaining, illustrating, and applying them, and then the properties of propositions and of relations in the same way.

The book is extremely well written, the author's style is engaging, and the publishers have made a pretty job of the printing and binding. The author has thought his subject through and knows what he is aiming at. If he has adopted the course which has been criticized above, it is because he has considered the alternatives, and deliberately adopted his own plan as the most expedient and desirable. The book deserves to be widely used, but should be used selectively and constructively rather than slavishly. It probably would require a good deal of explanation and interpretation on the part of the instructor. As it adopts a decidedly heretical point of view, it would be well to use it in conjunction with a more traditional text.

My attention has been called to several errata. On page 139 the following obvious error occurs: $xy + xz < (x + z)y$. On page 175–6 there appears to be a confusion as to whether or not the existence of the subject class is assumed. On page 198 *unitiated* occurs where perhaps *uninitiated* is intended. On page 208, line 20, sy is used where xy is intended. Problem 14, on page 386 which is taken from Lewis, is incorrectly quoted, and is insoluble as given. Lines 4–5 of the problem should read, "unless it is either heavy enough to sink a fishline or is *not* metal". The omission of 'not' spoils the problem, which is otherwise an entertaining one.

The illustrations and exercises with which the book abounds constitute a most admirable part of the text. Trivial and outworn examples are not found, but original and interesting exercises are invented or culled from a wide range of philosophy, literature, and science.

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The following books were received during January and February:

Progressive Scholasticism. By GERARDO BRUNI. Translated by JOHN S. ZYBURA. St. Louis, Herder Book Co., 1929.—pp. xxxviii, 185.

The Burden of Humanism. By ABRAHAM FLEXNER. Oxford, The Clarendon Press, 1928.—pp. 25.

Scientific Method in Æsthetics. By THOMAS MUNRO. New York, Norton, 1928.—pp. xi, 101.

John McTaggart Ellis McTaggart. By C. D. BROAD. London, Humphrey Milford (no date).—pp. 31.

Liberty in the Modern World. By GEORGE BRYAN LOGAN, JR. Chapel Hill, The University of North Carolina Press, 1928.—pp. xi, 142.

Methods of Private Religious Living. By HENRY NELSON WIEMAN. New York, The Macmillan Company, 1929.—pp. 219.

The Delphic Maxims in Literature. By ELIZA GREGORY WILKINS. Chicago, The University of Chicago Press, 1929.—pp. ix, 271.

Religion. By EDWARD SCRIBNER AMES. New York, Henry Holt and Company, 1929.—pp. vi, 324.

Spinoza. By LEON ROTH. Boston, Little, Brown and Company, 1929.—pp. xvi, 250.

An Outline of Social Psychology. By J. R. KANTOR. Chicago, Follett Publishing Company, 1929.—pp. xiv, 420.

The New Citizenship. By SEBA ELDRIDGE. New York, Thomas V. Crowell Company, 1929. Pp. vii, 357.

De La Nécessité. Par EUGÈNE DUPRÉEL. Archives de la Société belge de Philosophie, Fascicule 1. Brussels, M. Barzin, 6, Avenue Livingstone, 1928.—Pp. 40.

Einleitung in die Mengenlehre. Dritte, umgearbeitete, und stark erweiterte Auflage. Von ADOLF FRAENKEL. Berlin, Springer, 1928.—pp. xiv, 424.

Die Grenzen der naturwissenschaftlichen Begriffsbildung. Fünfte, verbesserte, um einen Anhang und ein Register vermehrte Auflage. Von HEINRICH RICKERT. Tübingen, Mohr, 1929.—pp. xxxix, 776.

Platons Selbstbiographie. Von HEINRICH GOMPERZ. Berlin, De Gruyter, 1928.—pp. 46.

Systematisches Handlexikon zu Kants Kritik der reinen Vernunft. Von HEINRICH RATKE. Leipzig, Meiner, 1929.—pp. v, 329.

Wandlungen der Weltanschauungen. Lieferung 5. Von KARL JOËL. Tübingen, Mohr, 1929.—pp. 160.

Logik. By ÁKOS VON PAULER. Translated from Hungarian to German by JOSEPH SOMOGYI. Berlin, Walter de Gruyter & Co., 1929.—pp. viii, 294.

Grundfragen der Wahrnehmungslehre. Von PAUL FERDINAND LINKE. Zweite, durchgesehene, und um ein Nachwort über Gegenstandsphänomenologie und Gestalttheorie vermehrte Auflage. München, Ernst Reinhardt, 1929.—pp. xxvi, 430.

Geschichte der philosophischen Ideen, von der Renaissance bis zur Gegenwart. Von HARALD K. SCHELDERUP. Translated into German by M. LEIXNER VON GRÜNBERG. Berlin, Walter de Gruyter & Co., 1929.—pp. viii, 232.

La Filosofia di Tommaso Hobbes. By ADOLFO LEVI. Milan, Società Editrice Dante Alighieri, 1929.—pp. 419.

La Libertà. By PIERO MARTINETTI. Milan, Libreria Editrice Lombarda, 1928.—pp. 500.

NOTES

Professor R. M. Wenley, head of the department of Philosophy in the University of Michigan, died in Ann Arbor on March 29th at the age of 67. Professor Wenley was a native of Edinburgh and a graduate of Glasgow and Edinburgh Universities. He was appointed professor and head of the department of Philosophy in the University of Michigan in 1896 and from that date was continuously active there, with the exception of the years 1925–1927, during which he was director of the British division of the American University Union in London. His earliest work, *Socrates and Christ*, was published in 1889, and was followed by numerous writings on philosophy, theology, and biography.

The following is a list of articles in current philosophical periodicals:

MIND, XXXVIII, 149: *G. H. Hardy*, Mathematical Proof; *H. W. B. Joseph*, The Growth of the Perception of the External World; *D'Arcy Wentworth Thompson*, Excess and Defect: or The Little More and The Little Less; *Reginald Jackson*, Locke's Distinction between Primary and Secondary Qualities; *William MacDougall*, Dr. Lloyd Morgan on Consonance of Welfare and Pleasure.

THE JOURNAL OF PHILOSOPHICAL STUDIES, IV, 13: *W. G. de Burgh*, Gentile's Philosophy of the Spirit; *C. Lloyd Morgan*, The Case for Emergent Evolution; *William Brown*, Religion and Science; *John Laird*, The Possibility of Rationalism in Ethics; *Olaf Stapleton*, The Location of Physical Objects; *C. Delisle Burns*, The Philosophy of Social Life; *C. E. M. Joad*, The One and the Many.

THE MONIST, XXXIX, 1: *Eugenio Rignano*, Outlines of a System of Morality Based on the Harmony of Life; *H. H. Wright*, Empirical Idealism in Outline; *Henry N. Wieman*, The Philosophy of Worship; *George A. Wilson*, The Search for the Concrete; *Helen M. Smith*, Sensible Appearances, Sense-Data, and Sensations; *Homer H. Dubs*, The Psychophysical Problem—A Neglected Solution; *Robert P. Richardson*, Relativity and its Precursors; *A. P. Uchenko*, Aristotelian Logic and the Logic of Classes; *F. C. S. Northrop*, A Reply Emphasizing the Existential Import of Propositions.

THE JOURNAL OF PHILOSOPHY, XXVI, 2: *Orlando O. Norris*, A Behaviorist Account of Consciousness. I; *F. C. S. Schiller*, The End of a great Legend; 3, *Orlando O. Norris*, A Behaviorist Account of Consciousness. II; 4, *Sidney Hook*, What is Dialectic? I; *Oskar Emil*, The Missing Link in Human Understanding.

THE HIBBERT JOURNAL, XXVII, 2: *Eleanor F. Rathbone*, Has Katherine Mayo slandered "Mother India"?; *John W. Graham*, A Religion for the Educated Indian; *William K. Stewart*, Christianity as Paradox; *G. G. Kullman*, An orthodox Russian in the Presence of God. An Example of Paradox in Worship; *F. S. Marvin*, the Human Value of the New Astronomy; *E. J.*

Webb, An Ancient Astronomer Speaks; *L. P. Jacks*, The Ethics of Leisure; *W. S. Hamilton*, The Ethics of Investment; *Hugh P. Vowles*, Labour a Manifestion of the Devil. A Reply to Mr. Lethaby; *Hugh Brown*, A Philosopher's Tragedy. Shakespeare and Spinoza; *H. A. Garnett*, Relativity in Prayer; *F. Clarke*, Education and the New English; *Charles Franklin Thwing*, What are the Tests of a nation's Civilization? Can America meet them?; *Sylvia Anthony*, Home-making as a Key Industry. A new Voter's Question to Mother England.

THE JOURNAL OF RELIGION, IX, 1: *Archibald G. Baker*, Jesus Christ as interpreted by the Missionary Enterprise; *B. H. Streeter*, The Broad Church and the Modernist Movement; *E. Boyd Barrett*, Can there be Tolerance without Understanding? *Anonymous*, Can Philosophy progress within the Framework of the Christian Faith?; *John W. Johnson*, Balthasar Huebmaier and Baptist Historic Commitments; *William Creighton Graham*, The Second Rescue of the Second Isaiah; *Wilhelm Pauck*, Luther and Butzer; *Henry J. Cadbury*, Egyptian Influence in the Book of Proverbs; *Clifford Manshardt*, The Movement towards Church Union in South India.

THE HARVARD THEOLOGICAL REVIEW, XXII, 1: *James Thayer Addison*, The Ahmadiya Movement and its Western Propaganda; *Robert P. Blake*, The Athos Codex of the Georgian Old Testament; *Robert P. Blake*, The Georgian Text of fourth Esdras from the Athos MS.

THE BRITISH JOURNAL OF PSYCHOLOGY, GENERAL SECTION, XIX, 3: *C. W. Valentine*, The relative Reliability of Men and Women in Intuitive Judgments of Character; *J. Ridley Thompson*, The Limits of Correlation between Three Variables; *Raymond Holder Wheeler*, The Action Consciousness; *H. R. De Silva*, An Analysis of the Visual Perception of Movement; *Stuart Carter Dodd*, On the Sampling Theory of Intelligence; *C. Spearman*, Formalism or Associationism?

THE PSYCHOLOGICAL REVIEW, XXXVI, 1: *Albert J. Harris*, Theoretical Studies from the Harvard Psychological Laboratory: Analysis: A Contribution to Psychological Method; *Robert M. Hutchins* and *Donald Slesinger*, Legal Psychology; *Edgar James Swift*, The Learning Process: A Criticism and a Theory; *John M. Fletcher*, An Old Solution of the New Problem of Instinct; *Paul A. Witty* and *Harvey C. Lehman*, Religious Leadership and Stability; *Forrest L. Dimmick*, A Re-interpretation of the Color-Pyramid; *Paul A. Witty* and *Harvey C. Lehman*, Further Remarks upon Character-Testing; *W. H. Roberts*, A Note on Anthropomorphism.

THE JOURNAL OF EXPERIMENTAL PSYCHOLOGY, XII, 1: *James J. Gibson*, The Reproduction of Visually Perceived Forms; *Roland C. Travis*, Protracted Passive Oscillation and Intermittent Rotation of the Body; *Arthur Jersild*, Primacy, Recency, Frequency and Vividness; *Wm. C. F. Krueger*, The Effect of Overlearning on Retention; *Ernst Thelin* and *Esther Royal Altman*, Identification of Monocular Functions.

THE AMERICAN JOURNAL OF PSYCHOLOGY, XLI, 1: *A. Ford*, Attention-Automization: An Investigation of the Transitional Nature of Mind; *E. S.*

Robinson and *F. Richardson-Robinson*, A Simple Series of Abilities; *J. G. Beebe-Center*, The Law of Affective Equilibrium; *G. H. Thompson*, Fitting of Frequency Functions to Urban's Lifted-Weights Results; *F. L. Wells*, Reaction-Times to Affects Accompanying Smell Stimuli; *B. L. Rosenbloom*, Configurational Perception of Tactual Stimuli; *P. R. Martin* and *S. W. Fernberger*, Improvement in Memory Span; *C. O. Weber* and *K. M. Dallenbach*, The Properties of Space in Kinæsthetic Fields of Force; *G. H. Estabrooks*, Intelligence and Pigmentation of Hair and Eyes in Elementary Schoolchildren; *P. H. Furfey*, Pubescence and Play-Behavior; *M. F. Washburn*, *K. Keeler*, *K. B. New*, and *F. M. Parshal*, Experiments on the Relation of Reaction-Time, Cube Fluctuations, and Mirror Drawing to Temperamental Differences; *R. Dodge* and *R. C. Travis*, A Duplex Marker; *W. N. Kellogg*, An Improved Model of McDougall's After-Image Apparatus; *C. A. Ruckmick* and *E. Patterson*, A Simple Non-Polarizing Electrode; *M. Metfessel* and *J. Tiffin*, A New Phono-Projectoscope; *W. B. Pillsbury*, The Cinematoscope as a Memory-Apparatus.

THE PSYCHOLOGICAL BULLETIN, XXVI, 1: *W. Brown*, Proceedings of the Western Psychological Association, Stanford University, August 3–4, 1928. 2, Instructions in regard to Preparation of Manuscript.

LA REVUE DE MÉTAPHYSIQUE ET DE MORALE, XXXV, 4: *V. Jankelevitch*, Prolégomènes au bergsonisme; *A. Spaier*, Pensée par universaux et Pensée par individus; *V. Delbos*, Les facteurs kantiens de la philosophie allemande du commencement du XIX^e^ siècle; *G. Gurvitch*, La philosophie phénoménologique en Allemagne: I. Edmund Husserl; *J. Benda*, Réponse à l'article du M. Dugas.

REVUE PHILOSOPHIQUE DE LA FRANCE ET DE L'ÉTRANGER, LIV, 1 & 2: *É. Goblot*, De la valeur de la chasteté; *P. Dupont*, La base métaphysique du relativisme; *A. Metz*, La géométrie euclidienne et la physique; *A. Spaier*, Remarques sur la maladresse.

REVUE D'HISTOIRE DE LA PHILOSOPHIE, III, 1: *Albert Rivaud*, Études platoniciennes. II: Platon et la musique; *Raoul Carton*, Le chiffre de Roger Bacon; *Albert Schinz*, Le rationalisme de Rousseau.

ARCHIVES DE PSYCHOLOGIE, XXI, 82: *Édouard Claparède*, Opinions et travaux relatifs à la theorie biologique du sommeil et de l'hystérie; *Léon Walther*, Étude technopsychologique d'une usine de produits alimentaires; *Richard Meili*, Hasard et psycho-diagnostic; *Hélène Antipoff*, Observations sur la compassion et le sens de la justice chez l'enfant.

RIVISTA DI FILOSOFIA, XX, 1: *G. Tarozzi*, Il valore filosofico del pensiero comune; *G. Solari*, Kant e la dottrina penale della retribuzione; *E. Grassi*, Empirismo e naturalismo nella filosofia tedesca contemporanea.

LOGOS, XI, 4: *A. Aliotta*, Francesco de Sarlo (Quarant'anni dopo la laurea); *F. Montalto*, Il formalismo etico e l'individualismo di E. Kant; *F. Guastella*, Le idee morali di Antonio Genovesi; *N. Abbagnano*, La filosofia di E. Meyerson e la logica dell'identità.

GIORNALE CRITICO DELLA FILOSOFIA ITALIANA, IX, 6: *Giorgione Fano*,

La filosofia di B. Croce; *Guido Calogero*, Per l'interpretazione del *Liside*, del *Simposio*, e del *Fedro*; *Rodolfo De Mattei*, Intorno ad alcuni scritti erroneamente attribuiti al Campanella; *Augusto Guzzo* e *Ugo Spirito*, Discussioni tra idealisti.

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